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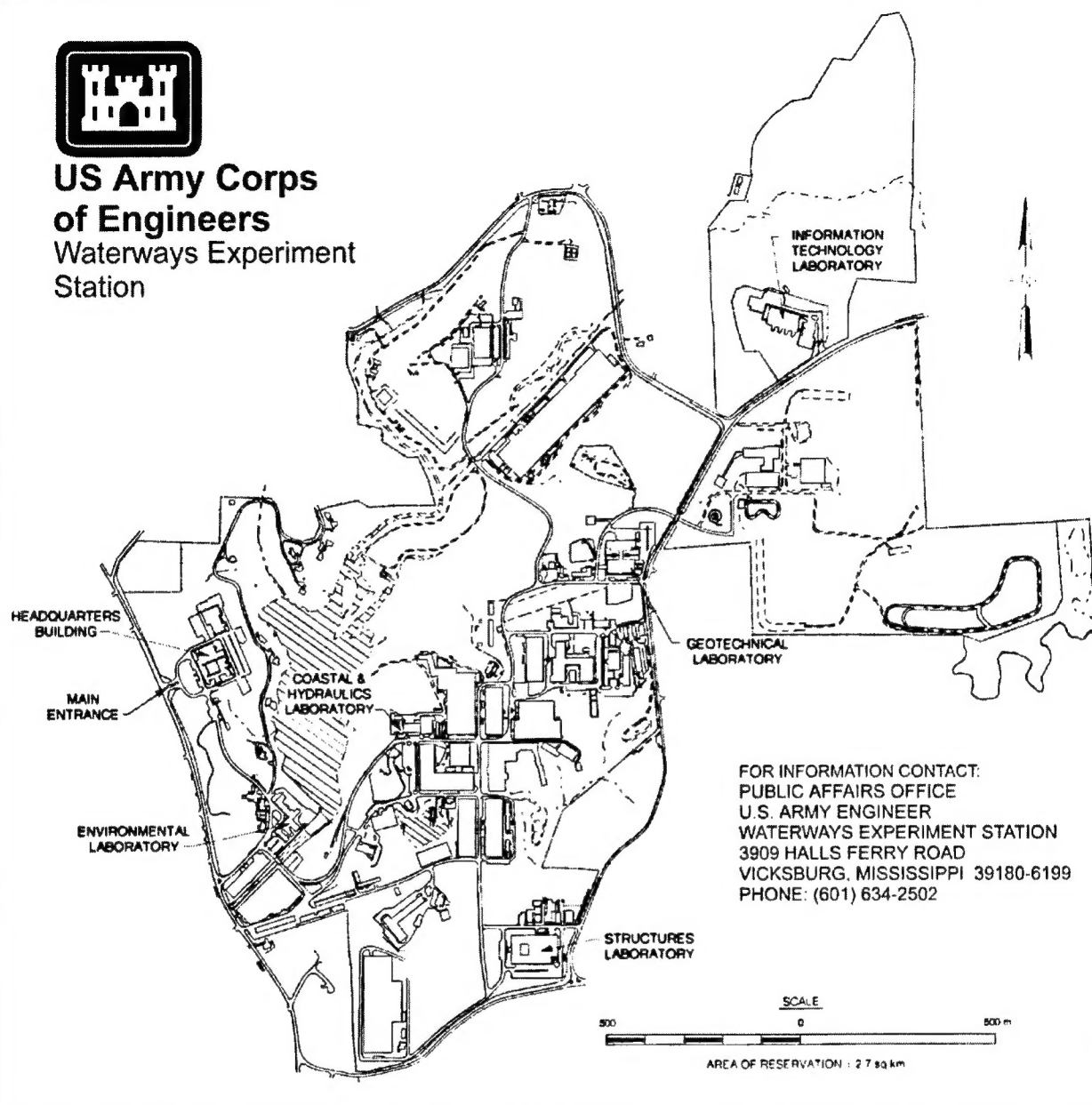
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# Preface

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The report herein was prepared as part of the Recreation Research Program (RRP), Work Unit 32891, titled "Assessment of Natural Resources Managed by the Corps of Engineers." This work was conducted by the U.S. Army Engineer Waterways Experiment Station (WES), for the Headquarters, U.S. Army Corps of Engineers (HQUSACE). HQUSACE Program Monitors were Ms. Judith Rice (CECW-ON), Mr. Ron Conner (CECW-PD), and Mr. Bill Erwin (presently CENWS-CO-SP).

Technical oversight and guidance were provided by Mr. E. Paul Pelouquin (CENPD-ET-ON), Field Review Group proponent for this work unit, and by a project steering committee appointed by Ms. Rice. The steering committee was chaired by Mr. Roy Proffitt (CESPK-CO) with members Messrs. Phil Benge (CENWW-OP-RM), David Brady (CESAS-OP-R), Jude Harrington (CENAB-OPF-R), and Don Wiese (CESWF-OD-M).

The survey instrument used to collect the data reported herein was developed with assistance from Mr. Pelouquin and the steering committee. It was reviewed and tested by the natural resources management staffs from the Lake Sonoma (California) and Granada Lake (Mississippi) projects. A database of survey responses was developed and managed by Dr. Daniel S. Allen, Louisiana State University, Baton Rouge. Portions of the survey analysis were conducted by Mr. Darrell Evans, Stewardship Branch, Natural Resources Division, Environmental Laboratory (EL), WES.

This report was prepared by Messrs. Richard L. Kasul, Resources Analysis Branch, Natural Resources Division; Chester O. Martin, Stewardship Branch, Natural Resources Division; and R. Scott Jackson, Resources Analysis Branch. It was prepared under the direct supervision of Dr. H. Roger Hamilton, Chief, Resources Analysis Branch; and the general supervision of Dr. David J. Tazik, Chief, Natural Resources Division; and Dr. John H. Harrison, Director, EL. Program Manager of the RRP during the initial stage of report preparation was Mr. Russell K. Tillman, EL. He was succeeded as Program Manager by Dr. Tazik as the report neared completion.

At the time of publication, Dr. Robert W. Whalin was Director of WES; COL Robin R. Cababa, EN, was Commander.

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# 1 Introduction

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The U.S. Army Corps of Engineers has constructed over 460 water resource development projects in 42 states. These reservoir and river projects provide important public services such as flood control, navigation, hydroelectric power, and water supply. The characteristics of these projects are highly diverse, ranging from large multipurpose reservoirs averaging over 120,000 ha (300,000 acres) on the Missouri River, to small reservoirs averaging less than 2,000 ha (5,000 acres) in the northeastern United States (Hart 1981). Many of these projects support navigation on major river systems such as the Mississippi, Ohio, and Columbia Rivers.

## Management Authorities

In recent years the Corps has shifted emphasis from water resource development to water resource management (Clarke and McCool 1996). One aspect of the Corps water resource mission is the management of natural resources associated with Corps projects. This mission was first set forth in the Flood Control Act of 1944 (P.L. 78-534) (U.S. Congress 1944). This act first recognized the value of natural resources, authorized the Corps to engage in stewardship of natural resources associated with Corps projects, and gave the Chief of Engineers broad discretion in fulfilling stewardship responsibilities.

Subsequent legislation provided authority for the Corps to address various aspects of natural resource management. The Forest Cover Act (P.L. 86-717) (U.S. Congress 1960) and subsequent agency interpretation require the Corps to engage in stewardship and management of forests and other vegetated lands for the purposes of forest, fish, and wildlife conservation. The Federal Water Project Recreation Act (P.L. 89-72) (U.S. Congress 1965) provided the Corps with the authority to engage in fish and wildlife enhancement while requiring cost-sharing with non-Federal partners to execute such programs. Recreation, fish, and wildlife were made project purposes by this act. Other legislation such as the Endangered Species Act (P.L. 93-205) (U.S. Congress 1973) and the Fish and Wildlife Coordination Act (P.L. 85-624) (U.S. Congress 1958) directs the Corps to undertake measures to protect threatened and endangered species and mitigate adverse environmental effects of Corps projects. Collectively, this legislation provides the Corps with a mandate and broad authority to provide natural resource management programs.

Natural resources management on Corps water resources development projects is also guided by authorities contained in authorizing legislation for each project. This legislation identifies approved purposes of each project that the Corps has been directed to construct and operate. A project is typically authorized for multiple purposes such as flood control, navigation, water supply, hydroelectric power, recreation, and fish and wildlife.

Implementation of statutory authorities for natural resources management on each Corps project is guided by a project master plan and an operational management plan. The project master plan identifies management objectives and general approaches for meeting those objectives. The operational management plan contains more detailed management prescriptions for meeting objectives set forth in the master plan. The project master plan and operational management plan are subject to approval by higher authority, and once approved, often provide long-term guidance for natural resources management activities on Corps projects.

## **Significance of Corps Natural Resources**

Corps projects contain almost 3.3 million hectares (8 million fee acres) of land and water resources that serve as the base for natural resource management activities. Two factors are particularly significant in affecting the scope and nature of Corps natural resource management activities. First, land resources on Corps projects usually comprise a riparian border around Corps reservoir and navigation projects (Hamilton and Reinert 1997). This land, including diverse wetlands on many projects, constitutes an environmentally significant resource supporting many important wildlife species (Harrington 1991). The configuration of Corps lands is substantially different from that of land resources managed by other Federal agencies such as the U.S. Forest Service and U.S. Bureau of Land Management, whose holdings usually comprise large blocks of land that can support a larger scale of natural resource management activities.

A second factor influencing the significance of natural resources is the proximity of Corps projects to urban areas. Eighty percent of Corps projects are located within 80 km (50 miles) of a metropolitan area. Many are natural resource islands in rapidly urbanizing landscapes. Habitat loss due to land use intensification has been identified as the single most important factor in species endangerment (Flather, Joyce, and Bloomgarden 1994). Fragmentation of plant, animal, and fish habitat caused by changes in land use patterns means that public lands are the last refuge for many vanishing species (U.S. Forest Service 1994). The proximity of Corps projects to population centers also results in intensive recreational demands. The Corps administers only about 2 percent of the Federal land available for outdoor recreation yet attracts over 30 percent of all recreation use that occurs on Federal lands (U.S. Department of the Interior 1992). Recreation use of Corps-managed natural resources makes an important contribution to the trend identified by Frederick and Sedjo (1991) that recreation has replaced commercial production of food and fur as the principal use of wildlife.



## Emerging Management Concepts

Two decades ago the Nature Conservancy (1975) reported rapid losses in ecosystems and species communities throughout the United States. This finding and other corroborating studies have resulted in agencies placing greater emphasis on understanding the impacts of human activities and the benefits of ecosystem level management (U.S. Forest Service 1994). The ecosystem management approach can be directed toward a variety of goals including the conservation of a single species (Hutto, Reel, and Landres 1987), the conservation of ecologically related groups of species such as waterfowl (U.S. Fish and Wildlife Service 1986), or the conservation of ecosystem characteristics such as aquatic biodiversity (Frissell and Bayles 1996). Salwasser, Schonewald-Cox, and Baker (1987) identify the importance of interagency cooperation in implementing ecosystem management programs. Martin et al. (1996) suggest that an ecosystem approach provides a means of managing for a variety of resources simultaneously and enables more efficient and effective conservation of biological diversity.

The Corps has initiated several formal efforts to understand the ecosystem-level impacts of its water resource management programs. The Upper Mississippi River System Environmental Management Program is probably the largest example of ecosystem management associated with Corps projects (U.S. Army Engineer District, Rock Island, 1997). Environmental aspects of water management plans on the Missouri and Columbia Rivers and the Everglades also address these issues at the ecosystem level. However, considerable technical and institutional challenges exist to effective ecosystem management by Federal agencies (Walters 1997).

Within the scope of statutory authority, Corps managers have considerable discretion in deciding the nature of natural resource management programs and the degree to which they apply emerging principles of ecosystem management and biological diversity. The riparian character of Corps water resource projects, their proximity to population centers, and rapidly changing regional land use patterns create both opportunities and challenges for Corps natural resource managers. The goal of this study was to understand how Corps project managers are responding to these issues in the formulation and execution of natural resource management programs.

## Purpose and Scope of Study

Much of the Corps natural resource management program is formulated and implemented by local natural resource managers at Corps projects. This study attempts to characterize this portion of the Corps program as the sum of the individual project efforts. The study is based on a detailed survey of natural resource management efforts administered to a sample of Corps projects. Objectives of the study are to characterize Corps natural resource management goals and objectives, identify the types of resources most often targeted for management, characterize the management

methods most often used to achieve management goals and objectives, identify agency and informational resources available to support natural resource management, and identify current and emerging issues and impediments to the management of Corps natural resources.

## 2 Methods

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### Sample Selection

Natural resource management on Corps water resource development projects was documented using a lengthy and detailed questionnaire mailed to a random sample of projects. A sampling frame for the survey was developed from a list of the 463 operational Corps water resource projects identified in the Corps of Engineer Natural Resource Management System (NRMS) Database (Headquarters, U.S. Army Corps of Engineers, 1996a). In developing the sampling frame, 38 of 44 projects with fewer than 40 fee hectares (100 acres) were removed from potential consideration because they appeared to have negligible natural resource assets. Most were damsites for which project acreage appeared to support mainly engineering assets. Then, 95 individual projects were combined into 21 groups. Each group contained from 2 to 11 projects managed from a single natural resource management office. The final list contained 348 projects or groups of projects identified with a single responsible management office (Appendix A).

Each of the 349 projects or groups of projects was placed into one of 10 strata corresponding to Corps divisions as they existed prior to 1997. A random sample of 6 or 9 projects was then drawn from each of the 10 strata, yielding a planned sample size of 66 projects in all (Table 1). In 8 of the 10 divisions, six projects were selected at random and without replacement from projects within the division. In each of the two remaining Divisions, Ohio River (ORD) and Southwest (SWD), nine sample projects were selected by the same method. The planned allocation sampled from 11-33 percent of projects in the different divisions. Nineteen percent of projects in the sampling frame were sampled overall. The geographic distribution of projects in the sample is shown in Figure 1.

Projects selected for the sample ranged in size from about 70 to 62,000 ha (170 to 153,000 acres) with an average size of about 10,120 ha (25,000 acres). The size distribution of sample projects closely followed the size distribution of all Corps projects (Figure 2).

In the random selection of projects within divisions, projects from 24 Corps districts plus the New England Division appeared in the sample. Of five districts that did not appear in the sample, none had more than three projects within their geographic boundaries and three had only one. Districts present in the sample tended to be represented approximately in



Figure 1. Geographic distribution of Corps projects selected to participate in the natural resources management survey

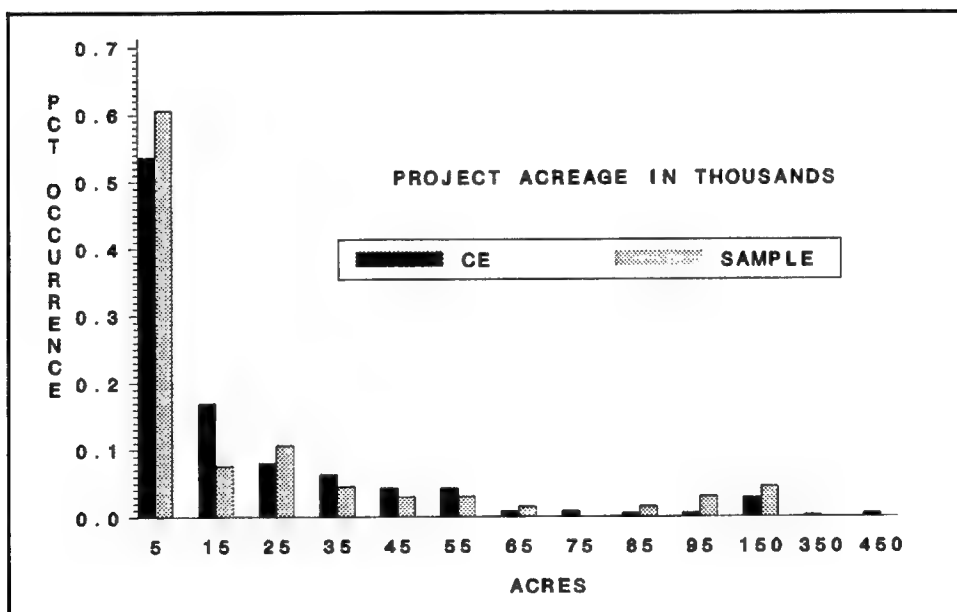


Figure 2. Size distributions of all Corps projects and those projects in the survey sample (1 acre = 0.4 ha)

proportion to the number of projects within their boundaries with variations due to random selection.

The number and boundaries of Corps divisions were changed during an agency reorganization that took place after the survey was sent out. Because the former division boundaries form the basis for sample stratification, they are retained for use in this report.

## **Survey Questionnaire**

The survey questionnaire was 40 standard pages long and contained 94 questions, many with several parts. The questions were arranged in sections addressing projectwide, terrestrial, aquatic, wetland, threatened and endangered, and cultural resources. The survey was designed to be disaggregated into the individual sections so the project manager could distribute the different sections of the survey to appropriate resource specialists on staff. A facsimile of the questionnaire is provided in Appendix B.

The survey questionnaire was reviewed by a project steering committee and the research program Field Review Group proponent for this study. It was also pretested by the natural resource management staffs at the Lake Sonoma, California, and Granada Lake, Mississippi, projects. Questions were deleted, added, or modified based on these evaluations.

To maximize survey response rate and to ensure thoughtful responses, one member of the steering committee telephoned the manager of each project in the sample to explain the purpose and value of the survey and to encourage cooperation. Two weeks later, the questionnaire was mailed to the project manager under a cover letter from the Office of Chief, Natural Resources Branch, Headquarters, U.S. Army Corps of Engineers, requesting the participation of the project. The questionnaire was mailed in January 1996. It was completed and returned by 62 of 66 projects by August 1996, a response rate of approximately 94 percent.

## **Analysis of the Responses**

A database of survey responses was constructed to facilitate analysis by computer. A separate input format and attribute coding scheme were developed for each question or part of a question. Responses were entered by hand on a keypad.

Other questions required short answers or essay responses. Responses to these questions often varied widely in detail and specificity. To facilitate summarization, responses were subjectively classified by topic area. This was accomplished by writing individual responses on index cards and then arranging them into appropriate response categories. Responses, including category attributes, were then entered into a database for analysis.

Several questions asked respondents to identify the species associated with different management efforts. The respondents were not provided with guidance regarding naming conventions; however, most respondents provided common names. An attempt was made to use standard common names in reporting the results. To accomplish this, names were changed to a standard form during data entry in those cases where species identity was clearly indicated. In some instances, reported names such as “geese,” “grouse,” or “deer” did not identify a unique species. These names were usually entered as reported by respondents. In other cases, respondents purposely reported species groups such as nongame, waterfowl, or Neotropical birds. These were also generally entered as reported by respondents. Depending on the level of detail desired, taxonomic names were reported either with the same degree of specificity provided by respondents or else they were aggregated into more general categories.

Most results presented here provide national level summaries of natural resource management on projects. However, for many questions, regional responses were informally examined during data analysis; and where important regional differences were found, they were reported in footnotes to tables.

In answers to some questions, respondents provided estimates of land area in acres. These responses were reported in the tables in acres and in the text in both hectares and acres.

## 3 Results

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### Management Overview

Natural resource management activities on Corps projects are typically authorized for enhancement, mitigation, or stewardship. Many survey respondents indicated that their natural resource management programs were conducted under more than one type of authority; however, management activity on most projects (50 of 62) is most often performed for stewardship purposes (Table 2).<sup>1</sup> This gives individual projects considerable latitude in establishing natural resource management objectives and programs.

Eighty-seven percent of projects use project staff for natural resource management purposes (Table 3). Several administrative sources of guidance regarding natural resource management are available to these staff. In the formulation and implementation of management activities, 58-60 percent of Corps projects indicated that they referred to the project master plan, operational management plan, and the annual work plan always or sometimes, while project design memoranda, project environmental impact statements, and other sources of administrative guidance were used much less often (Table 2).

Corps projects use several different methods of implementing their natural resource management programs (Table 3). Most projects (87 percent) use their own staff to formulate and implement major aspects of their natural resource management programs. Volunteer effort (87 percent of projects), outgrants to other management agencies (63 percent), cooperative management arrangements (53 percent), and agricultural leasing (45 percent) are also used. Except for agricultural leasing, projects generally expect similar to increased utilization of these approaches during the next 10 years. Noteworthy are anticipated increases in the utilization of project staff (47 percent of surveyed projects), volunteers (42 percent), and cooperative agreements (26 percent) in the implementation of natural resource management programs.

Many projects receive a substantial amount of water-based and land-based recreation use. This is supported by an often considerable recreation

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<sup>1</sup> The survey question or questions furnishing data to each table are given in parentheses in table titles and applicable column headings.

infrastructure, such as campgrounds, day-use areas, and boater access facilities that encourage a high density of recreation use in some areas of the project. Many projects also have undeveloped lands and associated facilities that help support lower density recreation. Natural resource management is necessarily influenced by the needs of these visitors. Survey respondents identified 34 different types of natural resource issues important to project visitors and to people who reside near projects (Table 4). Most often listed were the quality of fishing (34 of 62 projects), water quality (25), access to land and water resources (13), the availability of hunting and land for hunting (12), water levels and water level fluctuations (12), and animal pests (11). More than half (55 percent) of the concerns about animal pests involved Canada geese.

People who live near projects have many of the same concerns as project visitors generally, including water quality, the quality of fishing opportunity, water levels, water fluctuations, and animal pests (Table 4). But they tended to be more concerned about shoreline management issues and resource stewardship on the project and less concerned about access to land and water resources and the availability of hunting and land for hunting.

Local residents had some unique concerns (Table 4). The most important of these were wildfires on the project, trespassing by project visitors onto private property, and control of weeds on the project. Also of concern primarily to local residents were the continuation of agricultural leasing, hazardous trees on the project near local homes, noise pollution emanating from the project, and the opportunity to realize economic gains based on their proximity to the project.

The use of lands along project boundaries can affect the management of natural resources on the project. Fifty-four (87 percent) of sixty-two projects noted land use changes occurring along project boundaries (Table 5). Two types of land use changes were noteworthy. Development along project boundaries was indicated by 44 of the 62 projects surveyed (71 percent). While the perceived seriousness of development was lower than the perceived seriousness of some other land use changes along project boundaries, 84 percent (37 of 44) of projects expected the level of development to increase during the next 10 years. Logging of land adjacent to projects was also noted by 14 (23 percent) projects. Projects tended to rate logging as one of the more serious activities; about half (57 percent) of projects citing logging activity along project boundaries expected the amount of logging to increase in the next 10 years.

Several types of problems that can affect natural resources or natural resource management occur on projects. From a list of selected factors, projects identified dumping of trash, use of off-road vehicles, shoreline erosion, and wildlife poaching as concerns with the greatest extent and severity (Table 6). Three of these are people-related problems. These, as well as other concerns indicated by respondents, have potential to adversely affect recreation, interfere with natural resource management, and divert staff time from more productive management activities.



## Management Budgets

Corps projects spent an average of 56 percent of their yearly budget on operations and 31 percent on park management. In contrast, they spent an average of 6.6 percent (0-29 percent) of their annual project budget on natural resources management (Table 7). More than half (53 percent) of natural resource management expenditures were made for terrestrial resource management. The remainder was divided among the management of aquatic resources (24 percent), wetland resources (11 percent), and threatened and endangered species (11 percent).

About half of the projects anticipate a project budget allocation during the next 10 years that is similar to the current allocation (Table 7). However, a sizable percentage of projects anticipate either a relative decrease (24 percent) or increase (30 percent) in expenditures for operations, an increase in expenditures for park management (35 percent), and an increase in expenditures for natural resource management, especially for the management of terrestrial resources (27 percent).

## Management Staff

Fifty-five of sixty-two projects (87 percent) used project staff to formulate and implement a natural resource management program (Table 3). While staff size reported by projects varied considerably, there was an average of 4.6 permanent full-time staff and 3.6 temporary or seasonal workers on staff in addition to the project manager. Of full-time staff, approximately 22 percent worked exclusively in park management, 9 percent worked exclusively on natural resource management, and 72 percent had responsibilities in both park and natural resource management (Table 8).

In most areas of natural resource responsibility, more than 95 percent of responsible management staff had bachelor's (81-97 percent) or master's (2-19 percent) degrees (Table 9). Typically, more than half (47-68 percent) held degrees in disciplines related to the resources they managed. Approximately 10 percent of wildlife resource managers and 13 percent of forest resource managers were professionally certified in their respective disciplines. Generally, projects with a larger natural resource base had a larger management program with more funds and more personnel. These projects were more likely to have natural resource management specialists with advanced education in disciplines closely related to their area of responsibility. Projects with a smaller natural resource base had smaller budgets and were more likely to be managed by personnel responsible for both park management and natural resource management. These personnel more frequently had an educational background in parks and recreation rather than in natural resources.

## Volunteer Effort

Forty-four of sixty-two Corps projects (78 percent) indicated that they used volunteer groups to help implement their natural resource management program (Table 3). Projects identified many different types of local groups that volunteer labor and sometimes supplies and funds for natural resource management (Table 10). Frequent volunteers included Boy and/or Girl Scout groups (34 of 44 projects), outdoor sporting clubs (24), conservation groups (15), and schools (7). These groups most commonly provided unskilled labor for tasks such as trail maintenance (30 of 44 projects), tree planting (21), general cleanup (15), and stacking brush for fish shelters (12). However some of these groups also provided skilled labor for tasks such as development and maintenance of food plots (7 of 44 projects), wildlife surveys (6), controlled burns (3), and water quality monitoring (2). Survey respondents indicated that approximately 52 percent of the management tasks performed by volunteers would be discontinued without voluntary contributions. Consequently, the effort of volunteers can provide real contributions to project management. Approximately 78 percent of arrangements with volunteer groups presently involve ongoing efforts as opposed to one-time contributions.

## Natural Resource Outgrants

Approximately 63 percent of Corps projects have outgrants for natural resource management purposes (Table 3). Survey respondents reported 67 outgrant tracts ranging from 42 to 39,863 ha (103 to 98,500 acres) in size, with most (67 percent) less than 2,000 ha (5,000 acres) (Table 11). Approximately 88 percent of these were outgranted to state natural resource management agencies, mostly for wildlife management and/or low-density recreation, such as hunting and hiking. On approximately 12 percent of outgrants, timber production was a primary use, although wildlife management and recreation were usually concomitant uses on these tracts.

Survey respondents reported that three to four natural resource outgrants were returned to projects by state agencies between 1985 and 1995 (Table 12). In three cases, the outgrants were returned because the state lacked the budget and/or personnel to manage them. Survey respondents did not anticipate the return of any additional outgrants, but they indicated that seven (Table 12) or eight (Table 11) new outgrants were possible in the next 10 years, a potential increase of 10-12 percent in the total number of natural resource outgrants.

## Agricultural Leases

Approximately 45 percent of projects lease from 1.6 to 4,000 ha (4 to nearly 10,000 acres) of land to farmers (Table 13). Approximately two thirds of the agricultural acreage is in the SWD, Missouri River (MRD), and Lower Mississippi Valley (LMVD) Divisions. Nearly half (46 percent), much of it in the SWD, is untilled acreage used for grazing or hay. The other 54 percent is cultivated primarily for soybeans, cotton, corn, and wheat.

On the whole, projects view agricultural leasing as an important part of their wildlife management programs. On average, they rate the benefits of agriculture leasing for wildlife to be greater than the benefits to the local farmers (Table 14). Seventeen of twenty-eight projects (61 percent) that utilize agricultural leasing indicated that they impose lease requirements that benefit wildlife. Most often required were crop residuals (43 percent), cover strips (29 percent), grazing or haying restrictions (25 percent), pesticide and/or herbicide restrictions (18 percent), and plowing restrictions (14 percent) (Table 14). Approximately 42 percent of cultivated lands employ low-till (35 percent) or no-till (7 percent) agricultural practices (Table 13).

Approximately 24 percent of cultivated land is regarded by projects as marginal for farming (Table 13). Twenty-one of twenty-eight projects (75 percent) with agricultural leases indicated that the acreage under lease has been declining, in part because farmers are either terminating leases or failing to renew them in agriculturally marginal fields (Table 15). Marginal agricultural lands removed from the leasing program are typically maintained in grassland, reforested by planting or natural succession, or managed as wetland. In the next 10 years, approximately 46 percent of projects that lease land for agriculture anticipate a continuing decline in the number of leases accepted by farmers.

## Terrestrial Resources

Over half of Corps fee holdings are contained in the land buffer surrounding most Corps water resource development projects. On some projects this area provides a large and important terrestrial resource base. Depending partly on geographical location, the terrestrial areas have a large proportion of forest or woodland (71 percent of projects), grassland (42 percent), and/or scrub/grassland (13 percent) (Table 16).

About half the projects have conducted general species inventories for the birds (58 percent), mammals (55 percent), plants (53 percent), reptiles/amphibians (50 percent), and invertebrates (32 percent) found on terrestrial habitats (Table 17). On average, about one-third of these inventories were fairly complete, while two-thirds were partially complete.

Seventy-one percent of Corps projects have forested lands in amounts ranging from 20 to 34,000 ha (50 to 84,000 acres) (Table 16). Approximately

half (55 percent) of all projects surveyed have 400 hectares (1,000 acres) or more in forest land. About three-fourths of projects with forested lands have bottomland (79 percent) and/or upland hardwoods (73 percent), comprising an average of 32 percent and 47 percent, respectively, of the total forest acreage (Table 18). About half the projects have mixed hardwood/conifer (51 percent) and/or natural conifer (43 percent), comprising an average of 31 percent and 19 percent, respectively, of the total forest acreage. About half of projects (51 percent) also have conifer plantations that make up an average of 7 percent of their total forest area.

Forest inventories or timber cruises, which provide data on timber resources and also contain valuable ecological data on forest conditions, are available on half (50 percent) of projects with forested land (Table 19). No standard forest inventory method is used on Corps projects; however, about 30 percent of projects with forest inventories employ the U.S. Forest Service Continuous Inventory Of Stand Condition Class.

Approximately 57 percent of projects have commercial timber harvests on their forested lands, using clear-cutting more commonly in conifers and selection-cutting more often in hardwoods (Table 20). Timber management is typically more intensive in conifers than hardwoods. On average, conifers have smaller stand sizes and shorter age rotations. They also have a smaller proportion of their acreage in old growth (Table 18). Most projects that harvest timber (91 percent) have harvest restrictions in riparian zones (Table 21). While timber production is an important management objective on some projects, it is more commonly viewed as a habitat management practice to achieve stewardship and wildlife management objectives (Table 22).

As part of terrestrial habitat efforts, most projects (84 percent) maintain old fields, pasture, and other openlands. These areas are often intensively managed by prescribed burning, mowing, and other practices designed to control habitat succession (Table 23). Forty-two percent of all projects have at least a quarter of their terrestrial acreage in grasslands, many of these in geographical areas dominated by natural grassland ecosystems. Of these, about a third (37 percent) allow grazing on an average of 26 percent of their available acreage.

Approximately 26 percent of surveyed projects reported native prairie habitat in amounts ranging from 20 to 2,000 ha (50 to 5,000 acres). All of these projects have their native prairie habitats under active management involving primarily maintenance by fire and other methods, restoration and reestablishment, and/or protection (Table 24).

About half of surveyed projects listed changes in forest and openland habitats that they anticipated during the next 10 years (Table 25). Responses were wide-ranging with no category listed by more than six (10 percent) projects. Projects with forested lands most often cited reforestation of some agricultural lands (five projects), ongoing recovery from recent flood damage (four), initiation or completion of a project forest management plan (three), and a general increase in forest acreage (three). The most often anticipated changes in openland habitats were the reforestation of openlands (six), the introduction or increased use of warm-season grasses (four), and the increased use of weed control (three).

## Terrestrial Wildlife Management

Projects rate public use and resource stewardship as the two most important factors motivating the management of their terrestrial resources (Table 22). They consider management for habitat diversity as their most important objective; however, they rate the importance of habitat management for game species higher than for nongame species. The gap is expected to narrow in the next 10 years, but habitat management for game species is expected to remain of greater importance in the mix of game and nongame management objectives (Table 22).

Some of the most important aspects of wildlife management on Corps projects are associated with broader efforts to manage forests, grasslands, riparian zones, agricultural areas, and other habitats. Typically these are large-scale efforts designed to establish and maintain a desirable mix of different habitat types and successional conditions appropriate for the locality and the primary management objectives. In addition, most projects (92 percent) employ an array of more specific wildlife management practices designed to further improve habitat conditions for selected wildlife and/or project visitors engaged in wildlife-related recreational activities (Table 26). Some commonly used wildlife management methods, such as food plots (68 percent of projects) and forest openings (39 percent), are directed primarily at game species. Others, such as snag management (42 percent), are targeted primarily at nongame species. But most wildlife management measures, including artificial nesting or roosting structures (79 percent), prescribed burning (58 percent), and agricultural crop specifications (34 percent), are used to benefit both game and nongame wildlife (Table 26). Prescribed burning probably has the widest range of uses for terrestrial wildlife management on Corps projects (Table 27).

As part of the wildlife management efforts for game and nongame species, some projects conduct regular surveys to monitor the size of selected species populations (71 percent of projects) and recruitment or breeding success of selected species (56 percent of projects). Population surveys are most often conducted for bald/golden eagles (29 percent of projects), songbirds (21 percent), deer (19 percent), quail (13 percent), and waterfowl (13 percent) (Table 28). Almost all recruitment surveys are targeted at birds, most often wood ducks (34 percent of projects) and bluebirds (31 percent) that use nest boxes on Corps projects (Table 29). Population and recruitment surveys are usually performed by project and/or state agency personnel, though, most often, project personnel conduct the surveys of nongame species and state wildlife management agencies conduct the surveys of game species.

Only 27 percent of respondents indicated that they monitor wildlife habitat conditions on Corps projects (Table 30). Approximately a third of responses indicated the use of subjective or informal habitat assessment methods. Formal monitoring surveys usually addressed a specific aspect of habitat condition, such as nest site availability (five projects) or mast production (five projects). Surprisingly, only two projects listed timber cruises or inventories as habitat monitoring surveys (Table 30). Ten projects use habitat assessment models to evaluate wildlife habitat conditions

(Table 31). Most often applied were Habitat Suitability Indices (six projects) and the Wildlife Habitat Appraisal Guide (two projects).

Overall, Corps projects are an important provider of hunting opportunity, and in many instances, Corps project lands provide a substantial amount of the public hunting opportunity available locally. Fifty-five of sixty-two projects (89 percent) surveyed allowed hunting for one or more game species (Table 32). The game species that are important on the largest number of projects are deer (89 percent), turkey (60 percent), rabbit (52 percent), quail (45 percent), waterfowl (44 percent), squirrel (44 percent), and pheasant (28 percent).

As part of their game management efforts, about half (45 percent) of the projects that allow hunting also monitor some part of the game harvest, usually with check stations (76 percent) or mail surveys (40 percent). While Corps personnel participate in these efforts on some projects, harvest monitoring activities are usually carried out by the state wildlife management agencies (Table 33).

Animal control is used on about two-thirds (68 percent) of Corps projects (Table 34). Control efforts are most often required for various nuisance wildlife (48 percent of projects) and for feral domestic animals (31 percent). Wild animal species most frequently involved in control efforts are beaver (24 percent of projects), Canada geese (18), and deer (16 percent). Predators, as a group, are involved in damage control efforts on about 11 percent of projects. About half of the projects that control animal damage anticipate that the need for control efforts will increase over the next 10 years.

## **Aquatic Resources and Management**

Most Corps projects are associated with a regulated river reach, often a reservoir pool. On average, projects rated these aquatic areas as the most significant habitats on their projects (Table 35). Presently, and over the next 10 years, water quality and the condition of the fishery were rated the two most important issues involving the management of aquatic resources (Table 36). Also important were pollution issues, sedimentation, and shoreline erosion. In general, projects rated concerns about the condition of resources higher than concerns about the utilization of resources.

Operational activities on Corps projects involve primarily regulating the timing and duration of water releases to meet objectives associated with flood control, navigation, hydropower, and other project purposes. On many projects, operational activities must also accommodate recreation and natural resource needs. Nearly all projects indicated that there were one or more aquatic resource issues of concern to project operations. Of these, water fluctuations and fishery considerations were rated as the most important (Table 37). These involved upstream concerns on 24-27 percent of projects, within-project concerns on 82-90 percent of projects, and downstream concerns on 60-63 percent of projects.

Thirty-four of the sixty-two projects (55 percent) listed restrictions on project operations that were intended to accommodate recreation and natural resource concerns (Table 38). Most restrictions involved requirements for a minimum water release (39 percent) to support the downstream fishery, or requirements for the seasonal maintenance of reservoir pool level (18 percent) for fisheries, recreation, and waterfowl.

Forty-seven projects (76 percent) listed a wide range of conflicts associated with the use and management of aquatic resources (Table 39). These fell into three general categories involving conflicts between different recreation user groups (61 percent of projects), between project operations and natural resource management (24 percent), and between operational activities and recreation users (24 percent). More than half of listed conflicts involved recreational fishing or fisheries management issues.

The most prevalent were conflicts among different recreational user groups, particularly between fishers and pleasure boaters (35 percent of projects) and between personal watercraft users and other boaters (29 percent) (Table 39). The severity of these conflicts was rated lower than that of most other conflicts identified by respondents, but most respondents listing these two concerns anticipated that their severity would increase over the next 10 years. Aquatic resource conflicts presently rated as the most severe tended to be the least prevalent. These included hydropower versus fisheries management (11 percent of projects), water level management versus fisheries management (3 percent), water level management versus recreation (3 percent), and irrigation versus recreation (3 percent) (Table 39). Respondents listing these concerns most often anticipated that their severity would remain the same in the next 10 years.

Water quality concerns have led to health-related advisories on 56 percent of Corps projects, mostly in regard to swimming (39 percent) and fish consumption (27 percent) (Table 40). Most swimming advisories were due to fecal coliform contamination. Fish consumption advisories were due typically to heavy metals, dioxin, and agricultural pesticides. About 15 percent of projects had one or more health advisories currently in effect, most in regard to fish consumption.

Nuisance levels of eight plant species and six animal species were reported in aquatic areas of 39 percent of projects (Table 41). Most often reported nuisance animals were zebra mussels (11 percent of projects) and beaver (6 percent). Most often cited nuisance plants were Eurasian water-milfoil (8 percent), hydrilla (5 percent), and purple loosestrife (5 percent). Most of the projects with nuisance level plants and animals indicated that infestation levels have increased over the last 10 years, and most of these expect additional increases in the next 10 years.

Fisheries resource issues were among the most important natural resource concerns of project staff, visitors, and local residents. This is indicated by responses to several different questions. Warmwater fishes, for example, were identified by project staff respondents as the most important biological resource on Corps projects (Table 35). Respondents also listed the condition of the fishery as the most important natural resource concern of project visitors and the second most important concern of individuals residing near projects (Table 4). Projects also rated the condition

of their fishery as the second most important aquatic resource management concern in the next 10 years, second only to water quality (Table 36). These results indicate the overall importance of fisheries management issues on Corps projects.

Fisheries management is ideally based on information about the condition of fishery resources and their utilization by fishers. The status of fisheries management programs on Corps projects was evaluated by the availability of this type of information. Survey respondents indicated that some type of fisheries management data has been collected on 54 of 62 projects (87 percent) (Table 42). Thirty-four projects (55 percent) indicated that they had creel survey data; half of these conduct creel surveys regularly, at 1- to 3-year intervals. Most of the projects that conduct creel surveys use the data to monitor fish harvest as well as determine selected biological attributes of the catch (e.g., length-weight statistics). About half use creel surveys to collect attitude/opinion data from fishers. Few projects collect information on the expenditures associated with fishing trips (Table 42).

About 73 percent of projects have fish stock assessment data collected most commonly by electroshocking (71 percent) and/or gill nets (52 percent) (Table 43). Approximately 80-85 percent of projects that collect stock assessment data do so regularly, at 1- to 3-year intervals. On almost all projects, the state has the primary responsibility for fishery management surveys. Corps projects contribute funding for fisheries management surveys on fewer than 10 percent of projects and personnel on fewer than 25 percent of projects (Table 43).

## **Wetland Resources and Management**

Fifty of sixty-two projects (81 percent) reported wetland habitats in amounts ranging from 0.4 to 22,000 ha (1 to 54,000 acres) (Table 44). Approximately 42 percent of projects reported more than 40 ha (100 acres) of wetlands; approximately 20 percent of projects had more than 400 ha (1,000 acres).

Twenty of fifty projects with wetlands (40 percent) indicated that they had a wetlands inventory (Table 45). However, most of these (70 percent) indicated that their inventories were based only on cursory surveys of project wetlands. Only 12 (24 percent) of 50 projects with wetlands reported having wetland inventories that were more than 80 percent complete, and only 2 additional projects (another 4 percent) expected to reach 80 percent completion within the next 5 years.

No standard wetland classification system was used on Corps projects. Projects most commonly reported using informal classification methods. Only two formal classification methods were in use (Table 46). Ten projects with wetlands (20 percent) used the Fish and Wildlife Service National Wetland Inventory system, and five (10 percent) used the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987). Some projects appeared to use two or more different classification methods.



The 50 projects with wetlands rated the importance of nine potential management objectives. The highest rated were waterfowl management, biodiversity, and nongame wildlife management (Table 47). The most important management practices typically involved use of nesting structures, vegetation management, and moist soil management. Wetland management effort was directed at a broad range of wetland types and target species (Table 48). The high value placed on ecologically based management objectives and the broadly based management targets associated with wetland management contrasts with the management of terrestrial and aquatic resources, which tends to emphasize hunting and fishing recreation more explicitly.

Wetlands often are fragile habitats that may be adversely affected by factors largely beyond project control. Two such factors identified were the infestation of project wetlands by nuisance plants and animals and land use changes occurring along project boundaries. Thirty-eight percent of projects with wetlands listed one or more nuisance species present in project wetlands (Table 49). The list included 10 species of plants and 4 species of animals. Most often noted were purple loosestrife (five projects), beaver (four), and Canada goose (three). Most projects reporting these as nuisance wetland species indicated that their abundance has increased in the last 10 years, and will continue to increase over the next 10 years.

Twenty of fifty projects with wetlands identified ongoing or anticipated land use practices and changes along project boundaries that may affect project wetlands in the next 10 years (Table 50). Continuing development along project boundaries was by far (14 of 20 respondents) the most often cited off-project influence on project wetlands. Logging (four) and agriculture (four) were also cited by more than one project. Most of the anticipated effects of perimeter influences were detrimental. The most commonly listed were increased siltation (12 of 20 responses), increased pollution (3), reduced water quality (3), and increased surface runoff (3). Only 2 of 20 projects anticipated favorable changes: a reduction in agricultural activities resulting in reduced surface runoff and an improved wetland buffer.

## **Threatened and Endangered Species**

Forty-five of sixty-two surveyed projects (73 percent) reported that one or more federally listed threatened and/or endangered species occurred on their project (Table 51). Most commonly listed were birds (43 projects), invertebrates (7 projects), fish (6 projects), and plants (6 projects). The threatened bald eagle (proposed for delisting by U.S. Fish and Wildlife Service), reported by 38 projects (61 percent), was the most often cited species by a wide margin. Excluding the bald eagle, 29 respondents (47 percent) reported federally listed threatened or endangered species on their projects.

Efforts to identify threatened and endangered species on Corps projects are not yet complete. So far, 37 projects (61 percent) indicated that they

have initiated inventories to identify federally protected plants and/or animals (Table 52). Of these, only eight (13 percent) reported that inventories for protected species were 80-100 percent complete. In the next 10 years, this number is expected to increase to 12 projects (19 percent).

Efforts to identify threatened and endangered species on Corps projects have been conducted with varying degrees of rigor. In roughly equal numbers, projects identified their efforts as only cursory, thorough for selected groups, and thorough for all species (Table 53). Of projects that have initiated inventories, approximately 83 percent include birds and 50-57 percent include various other groups of federally listed species ranging from mammals (50 percent) to fish (57 percent). In addition, 76 percent of the projects that have initiated inventories of protected species have made some effort to include candidate species for Federal listing, and about half (55 percent) have made efforts to identify species on state protection lists (Table 53). About half (56 percent) of projects with species inventories have also made some effort to identify the critical habitats of protected species (Table 54).

In most instances, projects have the primary responsibility for stewardship of threatened and endangered species occurring on the projects. For about 82 percent of projects, these responsibilities are addressed in the project's Operational Management Plan (Table 55).

Thirty of forty-five projects (64 percent) with threatened or endangered species monitor the status of one or more species using population, recruitment, or habitat condition surveys (Table 56). Most of these projects (83 percent) conduct monitoring surveys for the bald eagle with these surveys. Half (50 percent) also monitor the status of selected other species.

As with other project natural resources, management of threatened and endangered species utilizes expertise and effort from other agencies. Inventory efforts include personnel from state agencies (72 percent) and the U.S. Fish and wildlife Service (52 percent) more often than from Corps projects (41 percent), or Corps districts and divisions (31 percent). About half (47 percent) of projects with threatened or endangered species also seek management assistance from other agencies (Table 52).

Seventeen of 45 projects (38 percent) that have a federally listed species indicated that their management of threatened and endangered species affects or is affected by various project activities, including project operations (12 projects), visitor recreation (11 projects), and natural resource management activities (6 projects) (Table 57). On seven projects (16 percent), management of listed species is also affected by activities such as the logging and development occurring along project boundaries.

Management of threatened and endangered species on natural resource outgrants is of special interest because of the interagency nature of natural resource management on these lands. Approximately 40 percent of projects with natural resource outgrants indicated that management activities associated with threatened and endangered species take place on their outgrants. Most often the lessee is responsible for these activities (Table 58).

Twenty-eight (62 percent) of forty-five projects with federally listed species have had informal consultations in the last 5 years with either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service regarding endangered species issues. Most were requests for assistance in identifying or managing endangered species on Corps projects (Table 59). However, nearly half (46 percent) of these projects asked for informal opinions regarding the effects of possible project actions on endangered species found on the project. In most cases, these issues were resolved informally. Projects reported only four instances in which formal Section 7 consultations were initiated, and of the three that were described in detail, all appeared to be primarily district actions rather than project actions (Table 60).

## **Unmet Management Needs**

All projects reported one or more unmet management needs associated with their aquatic, terrestrial, wetland, or threatened and endangered species resources. Forty-seven of sixty-two projects (76 percent) provided 52 responses concerning aquatic resources, more than for any resource category (Table 61). Thirty of the fifty-two aquatic resource responses (58 percent) identified management needs associated with improving project fisheries. Overall, fisheries management needs were identified more frequently than any other resource management need on the projects.

Respondents also listed 37 terrestrial resource management needs (Table 61). Additional funding and manpower (12) were mentioned most often, although uses for the needed funding and manpower were not specified. Specific terrestrial management needs most commonly identified habitat issues, particularly habitat restoration (six), additional habitat management (five), and habitat preservation (two).

The unmet wetland management needs most frequently listed were the construction of new wetlands (nine) and wetland inventories (seven). Similarly, implementation of species inventories (13) was the most frequently listed need in the management of threatened and endangered species (Table 61).

## 4 Discussion

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Natural resources management on Corps projects is part of the broader effort to operate projects for flood control, navigation, water supply, hydropower, and other project purposes. Within the scope of authorities provided by project authorizing legislation and other relevant laws and directives, Corps projects manage land and water resources for a mix of different uses, including agriculture, timber, fish, wildlife, watershed protection, and outdoor recreation. The natural resources component of Corps project management employs the multiple-use management concept (Headquarters, U.S. Army Corps of Engineers 1986, 1996b) and incorporates a mix of resource uses similar to that employed on U.S. Forest Service lands (Dana and Fairfax 1980; Loomis 1993).

A key feature of multiple-use management involves the need to balance different uses of available resources. Survey results indicate that, apart from operational considerations, recreation and resource stewardship are the two most important factors influencing natural resource management decision-making on Corps projects. In regard to aquatic resources, these needs translate primarily into fishing recreation and water quality, and in regard to terrestrial resources, they translate into game management and habitat diversity. Economic uses of the land, primarily agriculture and timber, are typically regarded as much lower priority uses than recreation and stewardship; where used, they are more often regarded as tools of habitat and wildlife management rather than primary resource uses.

Not all multiple-use management trade-offs can be balanced in a way that accommodates all desired resource uses. About three-fourths of Corps projects identified conflicts among project operations, recreation, and natural resource management. Most common (61 percent of projects) are conflicts among various recreation user groups, particularly between fishers and pleasure boaters (35 percent) and between personal watercraft users and participants in other water-based recreational activities (29 percent). Less common but considered more severe are the conflicts between project operations and both recreation and natural resource management noted by 24 percent of projects. Of these, operational activities involving hydropower production and flood control most often conflict with fisheries management and/or fishing recreation. In managing trade-offs between water operations goals and other project management objectives, about half (55 percent) of Corps projects utilize restrictions on project operational activities to accommodate recreation and/or natural resource concerns and management issues.

Balancing different uses of project natural resources is an ongoing process, in part, because of changing natural resource conditions on Corps projects. One of the most important trends for management on Corps projects may be the increasing development along property boundaries occurring on about three-fourths of projects. As boundary development increases, associated problems such as property encroachments may also increase. Hamilton and Reinert (1997) have shown that in a related situation, problems from extensive shoreline development on one Corps project diverted management effort away from more productive activities, producing a management program that was more reactive to development problems than proactive toward natural resource management. With anticipation of generally level to decreasing management budgets, similar management pressures may be encountered by projects experiencing boundary development and other problems that tend to divert management resources away from natural resource management activities.

The scope and nature of natural resource management on Corps projects depend in part on how projects value various project resources. In a direct comparison of selected resource types, projects rated aquatic areas such as reservoirs and river reaches within project boundaries as their most significant resource. These were followed by riparian corridors, wetlands, and then forest lands (Table 35). We believe that the reasons for this valuation involve a complex set of judgments about the institutional, ecological, and public use values of different resources (Doll et al. 1994; Apogee Research, Inc., 1996). Results of the survey provide some insight into how Corps projects apply these criteria.

Survey respondents consistently indicated that recreation use and natural resource stewardship most strongly influenced their perceptions and management of project resources, although the relative influence of these factors may differ for different types of resources. In terrestrial habitats, management of game species was reported to be more important than management of nongame wildlife or threatened and endangered species (Tables 22 and 35), suggesting that public use, particularly recreational hunting, has most strongly shaped value judgments about the significance and management of terrestrial resources on Corps projects. In regard to aquatic resources, both public use and stewardship considerations strongly influenced judgments about the value and management of these areas, but it is less clear which was most important. Depending on how the relevant questions were asked, either stewardship considerations (Table 36) or recreational use of fishes (Table 35) could be regarded as the more important factor in valuing the significance of aquatic resources.

While Corps projects generally view aquatic resources as more significant than terrestrial resources, they direct a larger share of the overall natural resource management program at terrestrial resources. On a budgetary basis, about half (53 percent) of project spending on natural resource management is directed at terrestrial resources, while 24 percent is directed at aquatic resources (Table 7). As a result, Corps projects describe a more expansive and varied terrestrial management program in their survey responses than they do an aquatic resource management program.

The survey results also suggest that Corps projects are more likely to increase their management efforts for terrestrial resources than for other

types of resources. When asked directly, more projects anticipated spending increases for management of terrestrial resources than for other resources (Table 7). Also, additional funding and/or manpower was cited as an unmet need far more often for the management of terrestrial resources than for the management of other resources (Table 61). These results suggest that there may be more potential demand for additional management of terrestrial resources than of other types of resources.

Management partners have an important influence on the overall scope and scale of natural resource management efforts on Corps projects. The most important management partner of the Corps project is usually a state natural resource management agency. Survey respondents list state natural resource management agencies as jointly or solely responsible for many natural resource management activities occurring on Corps projects. In fisheries management, the collection and evaluation of management data are primarily state responsibilities. State agencies are also active in terrestrial resource management, primarily for game management activities on natural resource outgrants. Overall, much of the management conducted by state agencies on Corps projects appears to support hunting and fishing recreation. Given the continued involvement of state agencies in the management of outgrants and aquatic resources, fish and game management will likely remain important management objectives on Corps projects.

Corps personnel are typically more active in terrestrial resource management than in aquatic resource management. The terrestrial management applied by project personnel seems to be roughly equally divided between game and nongame species. Corps efforts in nongame management appear to comprise most of the terrestrial nongame management occurring on Corps projects.

Survey respondents indicated that Corps projects most often directed natural resource management efforts toward selected individual species, groups of species, or the primary habitats of selected species. A large portion of the effort could reasonably be grouped into game and/or nongame management, and the projects themselves often used these terms when indicating management objectives or targets. Often nongame management recognized the importance of nonconsumptive wildlife recreation associated with wildlife viewing and related activities.

Natural resource management efforts in general, and wildlife management efforts in particular, are described in terms that suggest use-oriented management objectives, i.e., multiple-use management. It seems likely that resource stewardship is also thought of primarily in terms of resource uses. However, some projects describe management targets with terms that suggest more ecologically based management concepts such as biodiversity and ecosystem management. This is particularly evident in regard to wetland resources for which Corps projects explicitly rate species diversity as an objective that is second in importance only to waterfowl management (Table 47). It is also evident in attempts by some projects to direct management toward national or international resources such as Neotropical birds. However, the degree to which this type of recent ecological thinking is incorporated into natural resource management efforts on Corps projects is not readily apparent in the survey results.

As national and regional priorities for resource management become more clearly articulated, there is a growing desire to include them into natural resource management programs at all levels. A benefit of ecosystem management is the ability to more explicitly incorporate the broader national and regional priorities into natural resource management plans and activities. Most Corps involvement in formal ecosystem management has been coordinated by Corps districts or divisions and typically involved several different projects along a major waterway. Little evidence in the survey results suggests that Corps projects utilize ecosystem management as a primary approach to managing their local resources. However, Corps projects appear to be informally involved in some cooperative management activities that incorporate ecosystem management ideas, and the overall high degree of interagency participation in management activities on Corps projects indicates that projects have the cooperative management ethic required for effective ecosystem management.

Site characteristics suggest that resource management on Corps projects might benefit from application of ecosystem management concepts. For example, the riparian character of Corps projects creates relatively long property borders relative to the overall size of projects. As a result, land use and changes in land use occurring in the region surrounding projects are especially relevant in the management of project natural resources. In addition, Corps projects are an important component of major watersheds. Often Corps projects are responsible for management of only a portion of the entire watershed, but must consider the effects of project management activities on parts of the watershed that are outside project borders. For example, some projects are involved in management of conflicts concerning effects either upstream or downstream from their project (Table 37). These commonly involve ecosystem management issues.

Projects expect to maintain their strong commitment to a natural resource management program that directly supports recreation. At the same time, they also expect to increase their stewardship efforts for threatened and endangered species and other biological resources. They also recognize trends such as growing recreation demand and growing urbanization of the regional landscape that will increase natural resource management challenges in the near term. Overall, projects describe a need for more management effort, and many anticipate that at least some aspects of their programs will grow in the next 10 years. Accomplishing this will be especially challenging at a time when overall project budgets are not expected to increase greatly, if at all. An anticipated part of the solution is increased participation of non-Corps partners in the management of project resources. However, meeting future management needs may also require not just more management effort, but the development of more efficient and effective management strategies for meeting current and emerging challenges.

## 5 Summary

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Natural resources management on Corps of Engineers water resources development projects was documented from responses of management personnel to a lengthy and detailed questionnaire mailed to a stratified random sample of projects. The survey was sent in January 1996 to 66 Corps projects (19 percent of the sampling frame) selected at random within 10 Corps divisions located in the contiguous United States. Results are based on 62 completed questionnaires returned through August 1996, an overall response rate of approximately 94 percent.

Corps projects reported spending an average of 6.6 percent (0-29 percent) of their project budgets on natural resources management activities associated with terrestrial (53 percent of natural resources budget), aquatic (24 percent), and wetland (11 percent) resources and threatened and endangered species (11 percent). Approximately 87 percent of projects had project staff involved in natural resource management activities; 9 percent had staff involved exclusively in natural resources management, 72 percent had individuals who divided their time between park management and natural resources management activities.

Survey results suggested that natural resources management on Corps projects was directed primarily at a broad range of resource uses including outdoor recreation, fish, wildlife, timber, and agriculture. Management was also influenced by a stewardship ethic that emphasized water quality and habitat diversity. Natural resources management on Corps projects tended to be highly individualized because of project-specific differences in the type and condition of available resources; the availability of funding, personnel, and management partners; and the local physical and cultural environment surrounding each project.

On a scale from 1 to 10, respondents rated their aquatic resource base as the most significant resource on Corps projects (7.9). This was followed by riparian corridors (6.9), wetlands (6.7), and finally terrestrial resources (3.2-6.4), of which forested land (6.4) was viewed as most significant.

About half the total fee acreage of Corps projects supports an aquatic resource base composed mainly of impoundments on major waterways. The most important resource issues associated with the management of aquatic resources are water quality and condition of the recreational fishery. Management of aquatic resources on Corps projects involves balancing competing uses of aquatic resources among operations, recreation, and



natural resources management. Seventy-six percent of projects listed a wide range of resource use conflicts between different recreational user groups (61 percent of projects), between project operational activities and natural resources management (24 percent), and between operations and recreation users (24 percent). More than half of all listed conflicts involved recreational fishing or fisheries management issues.

Fisheries resource issues were among the most important natural resource concerns of project staff, visitors, and local residents. Survey respondents more often identified unmet management needs associated with aquatic resources than with any other type of resource on Corps projects. Most often listed, by 58 percent of projects, was the need to improve the condition of the project fishery.

Approximately half (53 percent) of the average natural resource budget on Corps projects is applied to the management of terrestrial resources. As a result, the terrestrial resource management efforts described by survey respondents were greater and more varied than those associated with other types of resources. The most important management objectives for terrestrial resources were recreation and habitat diversity. Management supporting recreation use of terrestrial resources was directed at both consumptive and nonconsumptive recreational activities, although management for game species was regarded as the more important. Hunting was allowed on 89 percent of Corps projects. Game species important on the greatest number of projects were deer (89 percent of projects), turkey (60 percent), rabbit (52 percent), and quail (45 percent).

Approximately 63 percent of surveyed projects outgranted from 40 to 40,000 ha (100 to 98,500 acres) of project land and water resources to other natural resource management agencies. Eighty-eight percent of natural resources outgrants were held by state fish and game agencies who managed these lands primarily for wildlife management and hunting recreation. Projects suggested that the number of outgrants could increase by 10-12 percent in the next 10 years.

Production of commercially valuable raw materials, primarily timber and agricultural products, was also an important aspect of terrestrial resource management on Corps projects. Commercial forestry was practiced on about 57 percent of projects, and where used, was an important aspect of habitat and wildlife management efforts. Agricultural leases existed on about 45 percent of projects. Leased acreage was most often used for hay or grazing (46 percent) and for cultivated crops (54 percent), primarily soybeans, cotton, corn, and wheat. Approximately 60 percent of the projects that offered agricultural leases to local farmers had lease requirements designed to benefit wildlife. Most often required were crop residuals, cover strips, and grazing or haying restrictions. Use of agricultural leasing is diminishing primarily because farmers are increasingly unable to continue leases on agriculturally marginal land.

Eighty-one percent of surveyed projects reported having wetlands in amounts from 0.4 to 22,000 ha (1 to 54,000 acres). The most important management objectives associated with wetlands were waterfowl, species biodiversity, and nongame wildlife. About half of projects with wetlands (56 percent) have begun a wetlands inventory based primarily on informal

methods (24 percent), the U.S. Fish and Wildlife Service National Wetland Inventory system (20 percent), or the Corps of Engineers Wetland Delineation Manual (10 percent). Projects most often cited the development of constructed wetlands and completion of wetland inventories as their most important wetland management needs.

Projects identified two principal threats to their wetlands. Forty percent of projects with wetlands indicated that land use changes along project boundaries were causing increased wetland sedimentation, increased pollution, reduced water quality, and other effects. Thirty-eight percent of projects with wetlands reported having nuisance plants or animals, and most of these anticipated an increase in wetland infestations in the next 10 years.

Federally listed threatened or endangered species were reported by 45 of 62 (73 percent) surveyed projects; more than half the surveyed projects (61 percent) reported the bald eagle, and about half (47 percent) reported other species. Efforts to identify threatened and endangered species on Corps projects were still ongoing; about 61 percent of projects had initiated inventories for threatened and endangered species, but most were not yet complete. Completion of a threatened and endangered species inventory was by far the most commonly cited need associated with the management of threatened and endangered species.

Project activities affected or were affected by threatened and endangered species on 38 percent of projects where listed species were known to occur. These activities included project operations (27 percent of projects with listed species), recreation (24 percent), and other natural resource management efforts (13 percent). In addition, activities occurring outside project boundaries, primarily logging and development, affected listed species on 16 percent of the projects where listed species were known to occur. Nearly half (46 percent) of projects with one or more threatened and/or endangered species had requested at least one informal opinion from the U.S. Fish and Wildlife Service within the last 5 years regarding the possible effects of a proposed project action on listed species. However, few informal consultations were ever elevated to formal Section 7 consultations.

Survey respondents indicated that natural resources management on Corps projects was motivated primarily by recreation and stewardship. The two most important goals associated with management of aquatic, terrestrial, and wetland resources always included one stewardship goal and one recreation goal. Water quality, habitat diversity, and species biodiversity were the primary stewardship goals associated with the management of aquatic, terrestrial, and wetland resources, respectively.

Recreation-related goals were usually associated with natural resource management activities aimed at selected individual species, groups of species, or the primary habitats of selected species. Much of this effort could be described as game and/or nongame management. Warmwater sport fishes, terrestrial game species, and waterfowl were the primary species-oriented management targets of aquatic, terrestrial, and wetland resource management, respectively. All of these are game species. Where direct

comparisons were made, survey respondents rated management for game species as more important than management for nongame species.

Contributions of management partners strongly influenced natural resource management on Corps projects. Most influential were state fish and wildlife agencies, which participated in some aspect of natural resource management on almost all Corps projects. State agencies typically managed most aspects of the recreational fishery on Corps projects. They also managed 88 percent of natural resource outgrants on Corps projects where game management and hunter recreation were the primary management objectives. While their efforts were not limited to these areas, much of the natural resource management conducted by state agencies on Corps projects supported fishing and hunting recreation.

Survey results suggested that Corps projects expect to maintain a strong commitment to a natural resource management program that supports recreation. At the same time, they see the need for and anticipate expansion of stewardship activities along a broad front. Completion of resource inventories, expansion of threatened and endangered species efforts, and increased management of nongame wildlife are among the stewardship activities that projects hope to pursue. They also recognize management challenges associated with increased development and other land use changes occurring along project boundaries. Projects expect to expand management efforts and meet emerging challenges with an expanded management role for project staff and with the increased participation of non-Corps partners in natural resource management activities.

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## **Tables**

Respondents provided estimates of land area in acres. To convert acres to hectares, multiply by 0.4047.

Entries in columns sum more than project totals because projects may have provided responses in more than one category.

Table 1. Selected population and sample characteristics of Corps water resource projects.

Corps Division <sup>a</sup>	Population Distribution			Sample Distribution			
	No. Projects <sup>b</sup>	Pct. of Projects	Total Acres	Planned		Realized	
				Sample Size	Pct in Sample	Sample Size	Pct in Sample
Lower Mississippi Valley	21	6.0	680,497	6	28.6	6	28.6
Missouri River	35	10.0	2,086,099	6	17.1	5	14.3
New England	32	9.2	51,953	6	18.8	6	18.8
North Atlantic	18	5.2	90,187	6	33.3	6	33.3
North Central	16	4.6	262,085	6	37.5	6	37.5
North Pacific	29	8.3	265,750	6	20.7	6	20.7
Ohio River	73	20.9	922,305	9	12.3	9	12.3
South Atlantic	21	6.0	953,424	6	28.6	6	28.6
South Pacific	18	5.2	99,860	6	33.3	4	22.2
Southwest	86	24.6	2,506,944	9	10.5	8	9.3
Total	349	100.0	7,919,104	66		62	

<sup>a</sup> Reflects the divisions in place prior to the 1996 reorganization.

<sup>b</sup> Identifies the number of projects in the survey sample frame after deleting projects with no natural resource assets and combining projects managed by a single natural resource management office.



Table 2. Major sources of authority (Q4) and guidance (Q6) for natural resource management on Corps projects.

Basis for Management Authority					Utilization of Selected Guidance				
Authority	No. Projects Responding	Percent of Management Activity			Source of Guidance	No. Projects Responding	No. Projects Using Guidance		
		Min	Max	Mean			Always	Sometimes	Never Apply
Enhancement	31	0	100	7.5	Design Memorandum	42	5	12	13
Mitigation	34	0	100	10.6	Project EIS	42	9	14	11
Stewardship	50	0	100	86.3	Project Master Plan	43	20	16	3
Others	9	30	100	58.6	Operational Management Plan	43	26	11	2
Don't know	11	0	100	33.2	Annual Work Plan	43	25	11	2
Total	62				Others:				
					ERGO <sup>a</sup>	3	0	3	0
					State Management Plan	3	1	2	0
					Miscellaneous others	7	5	2	0
					Total	62			

<sup>a</sup> Environmental Review Guide for Operations

Table 3. Utilization of selected approaches to implementing natural resource management on Corps projects (Q17).

Management Implementation Approach	No. Projects Reporting	Pct Of Projects Where Used	Change In Use Of Approach In Next 10 Years (No. of Projects)		
			Decrease	Same	Increase
Project Staff	55	87	7	19	29
Volunteers	44	78	3	15	26
Natural Resource Outgrants	37	63	3	26	8
Cooperative Agreements	32	53	3	13	16
Agricultural Outleasing	28	45	11	13	4
	—	—			
Total	62	100			

Table 4. Project staff evaluations of the natural resource concerns of project visitors (Q7) and local residents (Q8).

Nature of Concern	No. Projects Noting Concerns Of	
	Project Visitors	Nearby Residents
adequate fishery / fishing	34	24
water quality / pollution	25	31
water levels and fluctuations	12	14
shoreline management issues	9	14
animal pests	11 <sup>a</sup>	10
access to land/water	13	6
availability of hunting/hunting lands	12	7
resource stewardship	8	10
adequate/more game	6	8
wildlife/habitat management	7	7
forest management	4	8
personal security / safety	7	4 <sup>b</sup>
type and condition of recreation facilities	9	2
wildlife watching	8	2
aesthetics	5	5 <sup>c</sup>
dumping/litter	4	5
siltation	2	7
threatened and endangered species	3	5
wildfires	-	8
flooding	3	4
trespassing	-	7
unspecified weeds	1	6
user fees	5	-
ATV's	1	5
nuisance aquatic vegetation	2	3
restricted access/use	3	1
poaching	2	2
availability of fire wood	2	1
continuation of ag leases	-	3
economic opportunity	-	3
hazardous trees	-	3
increasing boundary development	-	3
noise	-	3
shade	2	-
Total Projects Responding	62	62

<sup>a</sup> Six of these 11 were concerns about too many Canada geese.

<sup>b</sup> All 4 of these expressed concern about hunting activity along project boundaries near private residences.

<sup>c</sup> All of these involved the desire of neighboring landowners to cut trees on the project to create a lakeview vista from their homes.

Table 5. Trends in the use of lands bordering Corps projects (Q19).

Types of Land Use Changes Anticipated Along Project Boundaries	No. Projects Responding	Present Extent <sup>a</sup>		No. Projects Anticipating Change In Next 10 years		
		Min	Max	Mean	Decrease	Same Increase
Continuing or Increasing:						
Development	44	1	10	5.9	0	7 37
Logging	14	2	10	7.6	2	4 8
Mining	3	6	10	8.0	0	0 3
Refuse/Litter	2	6	7	7.5	1	0 1
Land Privatization	1	8	8	8.0	0	0 1
Decline in Water Quality	1	4	4	4.0	0	0 1
Cover Type Changes Resulting In More:						
Agricultural land	4	2	8	5.5	1	2 2
Grazing land	4	1	10	4.4	1	0 3
Clearing of forest land	2	3	3	3.0	0	0 2
pine plantations	2	3	10	6.5	0	0 2
—						
Total Projects Responding	54					

<sup>a</sup> Rating of extent ranged from 1 (minor) to 10 (extensive).

Table 6. Selected problems potentially affecting natural resources or natural management efforts on Corps projects (Q18).

Selected Problem Area	No. Projects Responding	Extent <sup>a</sup>			Severity <sup>b</sup>		
		Min	Max	Mean	Min	Max	Mean
Dumping of trash	62	0	10	6.1	0	10	5.7
Off-road vehicles	62	0	10	5.4	0	10	4.9
Shoreline erosion	62	0	10	5.4	0	10	5.0
Wildlife poaching	62	0	10	4.4	0	10	3.9
Road/utility easements	62	0	10	4.2	0	10	2.9
Property encroachment	62	0	10	3.9	0	10	2.9
Livestock trespass	62	0	10	2.9	0	10	2.1
Vandalism of cultural resources	62	0	10	2.5	0	10	2.4
Wildfires	62	0	10	2.2	0	10	1.9
Theft of timber	62	0	10	1.9	0	10	2.1

<sup>a</sup> Extent rated from 0 (none) to 10 (common).

<sup>b</sup> Severity rated from 0 (none) to 10 (severe).

Table 7. Distribution of spending reported by Corps projects (Q1).

Spending Area	Pct Projects Spending in This Area <sup>a</sup>	Percent of Project Spending			No. Projects Anticipating Spending Change in Next 10 Yrs		
		Min	Max	Mean	Decrease	Increase	Same
Project O&M	99	0	100	55.9	15	19	23
Park O&M	95	0	81	31.9	7	22	23
Cultural Resources	66	0	8	1.0	2	7	32
Shoreline Management	46	0	19	1.8	4	4	30
Natural Resources	72	0	29	6.6	-	-	-
Terrestrial	69	0	20	3.5	3	17	24
Aquatic	48	0	24	1.6	2	9	29
Wetland	38	0	7	0.7	2	10	22
T&E	35	0	15	0.7	2	7	30
Other	3	0	25	1.4	1	6	1

<sup>a</sup> Based on all 62 projects responding.

Table 8. The availability and use of personnel (other than project manager) for park and/or natural resource management (a2).

Use of Personnel	Full-time Equivalents (FTE's)				Temporary or Seasonal Employees			
	No. Projects	No. of Personnel			No. Projects	No. of Personnel		
		Min	Max	Mean		Min	Max	Mean
Park Management	16	0	13	1.0	22	0	12	1.5
Nat. Res. Management	14	0	9.5	0.4	13	0	6	0.4
Both	53	0	26	3.3	30	0	20	1.8
Totals	59	0	53	4.6	59	0	20	3.6

Table 9. Education and background of Corps project staff responsible for the management of natural and cultural resources (03).

Resource	No. Projects Managing This Resource	Degree Level of Responsible Staff Member (Pct Distribution)			Degree in Relation To Resource <sup>a</sup> (Pct Distribution)		Percent Professionally Certified
		Assoc.	Bach.	Master	Related	Unrelated	
Cultural	45	1	93	6	6 <sup>b</sup>	94	0
Fisheries	30	0	81	19	65	35	0
Forest	36	2	90	8	68	32	13
Range	17	0	97	3	61	39	0
T&E species	30	6	88	6	47	53	-
Wetlands	27	0	98	2	51	49	0
Wildlife	43	0	93	7	59	41	10
Total	62						

<sup>a</sup> Resources on projects with substantial natural resource acreages are the most likely to be managed by natural resource specialists educated in a closely related scientific discipline. Resources on projects with little acreage are more likely to be managed by the project manager or rangers, who more frequently have college degrees in an unrelated area, often in park and recreation management.

<sup>b</sup> Few Corps projects have staff educated in disciplines related to cultural resource management because cultural resources on Corps projects are typically managed by District staff rather than project staff. Responsible project staff serve primarily as points-of-contact for cultural resource management.



Table 10. Contributions of volunteers to natural resource management on Corps projects (Q11).

Participating Organizations		Management Activities	
Organization Name	No. Projects Responding	Description	No. Projects Responding
Scout troops	34	Build/survey/maintain nest boxes	35
School groups	9	Trail maintenance	30
Sportsmen clubs	7	Tree planting	21
Fishing clubs	7	General cleanup	15
Quail Unlimited	6	Unspecified habitat mgt	13
Equestrian clubs	5	Brush piles for fish	12
Audubon Society chapters	3	Create/maintain food plots	7
Individual volunteers	3	Wildlife surveys	6
Lake associations	3	Erosion control	2
Local businesses	3	Stock fish	3
Outdoor clubs	3	Controlled burns	3
Universities	3	Water quality monitoring	2
Bike clubs	2	Misc activities	4
Birding clubs	2		—
Church groups	2		49
Civic groups	2		
Conservation clubs	2		
Waterfowl groups	2		
Miscellaneous groups <sup>a</sup>	16		
	—		
	50		

<sup>a</sup> Consists of volunteer organizations mentioned by only 1 project.

Table 11. Summary of natural resource outgrants reported by surveyed projects (Q12).<sup>a</sup>

Acreage Summary		Administrative Summary		Utilization Summary	
Outgranted Acreage	No. Outgrants	Managing Agency	No. Outgrants	Primary Uses <sup>c</sup>	No. Responses
100 - 999	17	Federal <sup>b</sup>	4	Wildlife Management	35
1,000 - 4,999	23	State	59	Waterfowl Management	8
5,000 - 9,999	9	Local	4	Forestry/Timber Management	6
10,000 - 49,999	13	University	1	Fisheries Management	5
50,000 - 99,999	3		—	Refuge/Preserve	3
not provided	2	Total	67		
Total	67			General Recreation <sup>c</sup>	18
				Hunting	8
				Hiking	3
				Total	86 <sup>d</sup>

<sup>a</sup> Information from 67 natural resource outgrants reported by 47 different projects. Excludes outgrants of developed recreation areas, such as boatramps or campgrounds, that were reported here by some respondents.

<sup>b</sup> Refers to Federal agencies other than the Corps of Engineers.

<sup>c</sup> Type of recreation was either unspecified or several types of low-density recreation were indicated.

<sup>d</sup> Total exceeds number of outgrants because more than one primary use was listed for some outgrants.

Table 12. Changes in the status of natural resource outgrants on Corps projects (Q13 and Q14).

Characteristics of outgrants returned in the last 10 years <sup>a</sup> (Q13)						Prospects For Future Outgrants (Q14)	
Division	Managing Agency	Acres	Year Of Return	Primary Use	Reason For Return	Response	No. Projects
NAD	County Parks Dept	100+	<2000	park	inadequate budget/personnel	No	43
SND	County Parks	230		park	inadequate budget/personnel	Yes	5
LWVD	Future Farmers of America	400	1991	recreation/agric/education	reorganization	Maybe	2
SAD	State Fish & Game	430	1980's	wildlife management	inadequate budget/personnel		51
LWVD	State Fish & Game	785	1995	hunting and hiking	land unsuitable for purpose		
NPD	State Fish & Game	2,158	1985	wildlife/waterfowl mgt	inadequate budget		
SND	State Fish & Game	10,000	1992	ag outgrant for wildl mgt	inadequate budget/personnel		

<sup>a</sup> While information on natural resource outgrants was requested, the 7 responses included 4 natural resource outgrants, 2 park or recreation area outgrants, and 1 probable agricultural outgrant.

Table 13. Characteristics of the agricultural leasing program on Corps projects (Q16a-d).

Distribution of Acreage										
Division	Projects Responding	No. Projects With Ag Leases	Per Project Acreage			Pct Crop Acreage That Is Marginal For Farming <sup>a</sup>	Crop Types		Soil Preparation	
			Min	Max	Mean		Crop	Pct of Total Reported Acreage	Tillage Method	Pct Acreage
LHVD	6	4	400	9,180	3,938	51	grazing	29	Conventional	58
MRD	5	3	1,286	8,156	3,971	25	hay	17	Low Till	35
NAD	6	1	1,120	1,120	1,120	0	soybeans	17	No Till	7
NCD	6	2	4	720	362	8	cotton	9		—
NED	6	2	6	325	165	0	corn	6	Total	100
NPD	6	3	4	1,000	380	33	wheat	4		
ORD	9	4	200	2,310	1,251	4	milos	2		
SAD	6	3	80	1,700	727	60	others	16 <sup>b</sup>		
SPD	4	1	93	93	93	0		—		
SWD	8	5	94	9,700	4,666	37	Total	100		
	—	—	—	—	—	—				
Overall	62	28	4	9,700	2,716	24				

<sup>a</sup> Calculations exclude acreage for pasture and hay.

<sup>b</sup> Consists mostly of unspecified acreage combinations of soybeans, wheat, and corn.

Table 14. Program (Q16e) and wildlife (Q16f) benefits associated with agricultural leasing.

Perceived Benefits Of Ag Leasing Program (Q16e)			Lease Requirements Benefiting Wildlife (Q16f)	
Benefit	No. Projects Responding	Importance Of Benefit <sup>a</sup> (mean ranking)	Lease Requirement	No. Projects Responding
Wildlife	26	1.6	Leave crop residuals	12
Cover type mgt	21	2.1	Provide cover strips	8
Local farmers	21	3.0	Grazing/haying restrictions	7
Local tax base	19	3.4	Pesticide/herbicide restrictions	5
Others <sup>b</sup>	12	-	Plowing restrictions	4
	—		Delayed harvest requirements	3
Total Projects	28		Provide food plots	3
			Provide winter cover crop	1
			Restrictions on crop type	1
			Total Projects	17

<sup>a</sup> Projects ranked listed benefits from 1 (most important) to 5 (least important).

<sup>b</sup> Other benefits cited for use of agricultural leasing were: vegetation control, wildfire control, reduce need for burning, maintaining openland for future wildlife management objectives, reduce need for mowing, and public relations.

Table 15. Effects of changes in agricultural leasing on Corps projects (Q16g and Q16h).

Fate Of Land That Has Been Removed From Agricultural Leasing Program (Q16g)		Anticipated Changes in Agriculture Leasing In The Next 10 Years (Q16h)	
Uses	No. Projects Responding	Description	No. Projects Responding
Maintain as grasslands	12	Reduce agricultural leasing	11
Allow succession to climax	7	reforestation (3)	
Reforestation	4	convert to wetlands (2)	
Unspecified tree planting	3	eliminate marginal leases (2)	
Create wetlands	2	plant trees (1)	
Burn for unspecified purposes	2	Introduce cover strips	2
Create pine plantation	1	Create terraces	1
	--	Decrease no-till acreage	1
Total Projects	21	Relax grazing restrictions	1
		Eliminate grazing	1
		Discontinue all ag leasing	1
			--
		Total Projects	16

Table 16. Major terrestrial cover types on Corps project lands (Q20).

Cover Type	No. Projects Responding	Acreage		Percent of Project Terrestrial Acreage			No. Of Projects On Which Cover Type Exceeds 25% Of Terrestrial Acreage
		Min	Max	Min	Max	Mean	
Grassland	52	50	28,600	1	100	63	26
Forest/Woodland	50	50	86,480	1	100	35	44
Scrub/Brushland	39	15	12,570	1	94	24	13 <sup>a</sup>
Total Projects	62						

<sup>a</sup> Eight of these are projects with desert shrub ecotypes in the North Pacific (3), Southwest (3), and South Pacific (2) Divisions. The remaining 5 are projects extensive with shrub or brushlands in the Ohio River (3), New England (1), and North Atlantic (1) Divisions.





Table 18. Selected characteristics of major forest types occurring on Corps projects (Q26).

Forest Type	Composition of Forested Land				Available Old Growth Forest <sup>a</sup>				Forest Stand Size				Stand Rotation Age			
	No. Projects		Percent of Forest		No. Projects		Percent of Type		No. Projects		Acres		No. Projects		Years	
	Responding	Min	Max	Mean	Responding	Min	Max	Mean	Responding	Min	Max	Mean	Responding	Min	Max	Mean
Upland hardwood	27	3	100	47	22	0	70	17	21 <sup>b</sup>	5	500	87	10	75	200	110
Bottomland hardwood	29	2	100	32	22	0	80	16	24	3	877	107	7	60	200	101
Mixed conifer/hardwood	19	1	100	31	14	0	75	9	17	1	500	60	8	50	120	85
Natural conifer	16	1	95	19	11	0	100	10	12	<1	408	49	6	50	80	63
Plantation conifer	19	1	35	7	13	0	2	0	14	<1	100	20	7	50	100	70
	—				—				—				—			
Total Projects	37				27				30				14			

<sup>a</sup> Definitions of old growth may vary by project.

<sup>b</sup> The summary of stand size in upland hardwoods omits one project that reported its entire forested area of 16,563 acres as a single stand.

Table 19. Availability of forest inventories of Corps project lands (Q25).

Current Forest Inventory (Q25a)		Forest Inventory Systems (Q25b)		Forest Inventory Participants (Q25c)	
Availability	No. Projects Responding	Method Reported	No. Projects Responding	Affiliation	No. Projects Responding
Yes	23	US Forest Service Continuous	7	Project forester	16
No	23	Inventory of Stand Condition Class		Unspecified project personnel	13
Not applicable	13	Non-permanent plots	4	State forestry agency	11
	—	Permanent plots	3	Consulting forester	5
Total Projects	59	State method	2	Student intern	2
		Natural Resource Inventory System	1	U.S. Fish and Wildlife Service	2
		Silvoh Forest Inventory System	1	State wildlife management agency	1
		Unspecified	4		—
		Total Projects Responding	22	Total Projects Responding	23

Table 20. Selected aspects of forest management on Corps projects (Q27 and Q29).

Primary Harvest Method (Q27)				Fuelwood Removal By Project Visitors (Q29)			
Forest Type and Cutting Method	No. Projects Responding	Percent of Forest Type		Allowable Removal Methods	No. Responses	Percent Of Forest Open	
		Min	Max			To Removal	No. Responses
Conifers				Dead standing timber	18	1	10
Clear cut	11	10	100	Fallen trees	25	11	25
Selection cut	11	10	100	Residual tree parts	12	26	50
				Harvest debris	6	51	75
Hardwoods					—	76	100
Clear cut	8	1	100	Total Responses	30		—
Selection cut	15	2	100			Total Responses	23
	—						
Total Projects	20						

Table 21. Occurrence (Q32a) and management (Q32b) of riparian zones on Corps projects.

Occurrence on Corps Projects (Q32a)			Use of Selected Management Practices (Q32b)		
Percent Occurrence	No. Projects Responding		Practice	No. Projects Responding	No. Projects Using Practice
					Sometimes Regularly
1 - 2	12		Bank protection	39	32
3 - 5	7		Buffer zone/corridor management	39	16
5 - 10	9		Access restriction/fencing	31	19
10 - 20	12		Revegetation/restoration	36	29
20 - 30	10		Stream improvement	21	20
30 - 40	4		Timber harvest restrictions	32	7
40 - 50	0			—	
50 - 100	6		Total Projects Responding	57	
Total Projects	60				



Table 23. Selected aspects of the management of grasslands and other openlands on Corps projects (Q33b and Q36).

Use of Selected Management Practices (Q35)				Percent of Natural Grasslands Used For Grazing (Q33b)	
Practice	No. Projects Responding	No. of Projects Where Used		Percent	No. Projects Responding
		Sometimes	Regularly		
Prescribed burning	36	16	20	0	19
Bush hogging	38	15	23	1 - 10	5
Chaining/cabling	5	3	2	11 - 25	2
Disking/plowing	38	15	23	26 - 50	2
Mowing	45	11	34	51 - 75	2
Seeding/planting	49	21	28	76 - 100	0
Total Projects	53	Total Projects		30	

Table 24. Status of native prairie on Corps projects (Q37).

Occurrence of Prairie on Projects					Availability of Habitat Inventories On Corps Prairie Lands					Prairie Management Practices		
					Status of Inventory		Participating Organizations <sup>a</sup>					
					Status	No. Projects Responding	Organization	No. Projects Responding	Practice	No. Projects Responding		
Division	No. Projects Responding	Min	Max	Mean								
LMVD	2	140	4500	2320	Partly complete	10	State agency	4	Prescribed burning	12		
MRD	1	5000	5000	5000	None	5	US Fish and Wildlife Service	2	Planting of prairie species	9		
NCD	6	5	210	64	Complete	1	Voluntary organizations		Habitat protection	5		
ORD	4	6	120	44		—	Quail Unlimited	2	Establish/reestablish prairie	4		
SAD	1	35	35	35	Total Projects	16	Unidentified volunteers	2	Habitat management	4		
SWD	2	687	1150	919			Boy Scouts	1	Restoration of old fields	2		
	—	—	—	—			National Audubon Society	1	Unspecified rotation	2		
All	16	5	5000	754			Pheasants Forever	1	Monitoring conditions	1		
							Sierra Club	1	Rotational mowing	1		
							Total Projects	—	Outgrant management	1		
								11	Total Projects	—		
										16		

<sup>a</sup> Does not include participation of Corps projects

Table 25. Anticipated changes on forest lands (Q31) and grasslands and other terrestrial openlands (Q36).

Ongoing And/Or Anticipated Changes On Forest Lands And Their Management (Q31)		Anticipated Changes On Openlands In Next 10 Years (Q36)	
Anticipated Changes	No. Projects Responding	Anticipated Changes	No. Projects Responding
Reforestation of some agricultural land	5	Reforestation	6
Recover flood-damaged forest land	4	Restore/increase warm-season grasses	4
Initiate/complete forest management plan	3	Increase weed control	3
Increase forest acreage	3	Reestablish prairie	2
Loss of pine to pine beetles	2	Increase prescribed burning	2
Improve riparian woodlands	2	Initiate/increase bush hogging	2
Continue/increase timber harvest	2	Allow natural succession	2
Increase controlled burns in forest stands	1	Deterioration of range/grassland	2
Continued succession from pine to hardwood	1	Encourage native plants	2
Declining natural regeneration of bottomland forest	1	Decrease seeding/mowing	2
Convert some forest to openland turkey brood range	1	Reduce management (budget cuts)	1
	—	Restoration of degraded grasslands	1
Total Projects Responding	25	Increase hay cutting	1
		Increase grassland acreage	1
		Unspecified changes:	
		Reclamation	1
		Habitat changes due to flooding	1
		Vegetation restoration	1
		Total Projects Responding	20



Table 26. Use of selected terrestrial wildlife management practices on Corps projects (Q40).

Selected Terrestrial Wildlife Management Practices <sup>a</sup>			Responsible Organization	
Management Practice	No. Projects Responding	Target Species/Taxa (No. Responses)	Organization	No. Responses
Nesting/roosting structures	49	Bluebirds (31), Wood duck (30), Owls/hawks (22), Waterfowl (17), Bats (7), Other (28)	Project only	351
Food plots or patches	42	Deer (20), Nongame (16), Turkey (14), Quail/dove (14), Other game (29), Other (7)	State only	196
Prescribed burning	36	Various nongame (22), Deer (9), Turkey (8), Other game (21), Other (4)	Project/state jointly	133
Other food or cover planting	35	Songbirds (8), Deer (7), Turkey (7), Quail (6), Rabbit (5), Other (41)	Federal <sup>b</sup>	36
Edge maintenance	34	Songbirds/nongame (18), Deer (15), Turkey (10), Quail/grouse (9), Other game (17)	Volunteer <sup>c</sup>	27
Snag management	26	Woodpeckers/other birds (14), Cavity nesters/dwellers (9), Other (15)	Contractor <sup>d</sup>	9
Forest openings	24	Deer (15), Turkey (11), Grouse (4), Songbirds (3), Other (15)	County	1
Crop specification	21	Nongame (10), Ducks/geese (8), Deer (7), Other game (13), Other (4)	Other <sup>e</sup>	29
Fences and crossings	19	Various nongame (11), Upland game (8), Deer (3), Livestock (2)	Total Responses	782
Forest density	18	Small game (11), Deer (10), Turkey (7), Nongame/songbirds (7), Other (2)		
Water supply	17	Waterfowl (9), Deer (2), Upland birds (2), Other (10)		
Corridor development	13	Various nongame (8), Small game (5), Deer (4), Turkey (2), Other (5)		
Stocking	12	Pheasant (6), Turkey (4), Canada goose (2), Other (6)		
Supplemental feeding	7	Deer (5), Turkey (4), Waterfowl (2), Other (1)		
Pasture development	7	Various grasses (5), Songbirds (2), Other (5)		
Total Projects Responding	57			

<sup>a</sup> Several respondents included fisheries management activities in their responses. These were not included in this table.

<sup>b</sup> Most outgrant leases were held by a state wildlife management agency.

<sup>c</sup> Usually in conjunction with project and/or state.

<sup>d</sup> Usually working under supervision of project or state.

<sup>e</sup> Consists most of 3 or more of above listed organizations managing jointly.

Table 27. Utilization of prescribed burning on Corps projects (Q24a and 24b).

Where Used (Q24a)		Purpose (Q24b)	
Habitat	No. Projects Responding	Response	No. Projects Responding
Openland <sup>a</sup>	31	Wildlife habitat management	30
Hardwood forest	9	Grassland maintenance	26
Coniferous forest	8	Native prairie restoration	18
Wetland	7	Wildfire hazard reduction	16
Others		Forest understory management	16
Prairie	1	Forest site preparation	8
Mixed forest	1	Marsh/wetland management	7
Dam/levee	1	Vector control	1
Unspecified	1	Others	
	—	Flood control	1
		Control dam vegetation	1
Total Projects	36	Total Projects	—
			38

<sup>a</sup> Includes rangeland, forest openings and other types of grasslands.



Table 29. A summary of wildlife recruitment surveys on Corps projects (Q44c).

Recruitment Survey Method		Taxa Surveyed		Frequency of Survey		Participating Agency	
Method	No. Responses <sup>a</sup>	Taxa	No. Responses <sup>a</sup>	Interval	No. Responses <sup>a</sup>	Agency	No. Responses <sup>a</sup>
Nest counts/success	35	Birds		Annually	79	Project alone	34
Nest box survey	29	Wood duck	21	Every 2-5 yrs	3	State alone	22
Brood count	13	Eastern/western bluebird	19	Every 6+ yrs	1	Both above	5
Use inventory	4	Bald/golden eagle	7		—	Volunteer alone	4
Breeding success	1	Canada geese/geese	7	Total Responses	83	Volunteer supported <sup>b</sup>	4
Hunter success	1	Waterfowl	6				—
Banding	1	Osprey	5			Total Responses	69
Winter population	1	Songbird/neotropical birds	2				
Tracking	1	Turkey	2				
	—	Kestrel	2				
Total Responses	86	Purple martin	1				
		Woodcock	1				
		Chukar	1				
		Common barn owl	1				
		Great blue heron	1				
		Hungarian partridge	1				
		Interior least tern	1				
		Peregrine falcon	1				
		Piping plover	1				
		Quail	1				
			—				
		Others	81				
		Squirrel	2				
		Raccoon	1				
		Ornate box turtle	1				
		Upland game	1				
			—				
			5				
		Total Responses	86				

<sup>a</sup> Thirty-five of 62 projects surveyed reported at least one annual or periodic recruitment survey.<sup>b</sup> Indicates recruitment surveys in which volunteers worked concomitantly with responsible personnel from Corps of Engineers.

Table 30. A summary of terrestrial habitat surveys conducted on Corps projects (Q44a).

Habitat Survey Method		Primary Target of Survey Effort			Frequency of Effort		Participating Organization	
Method <sup>a</sup>	No. Responses <sup>b</sup>	Taxa	No. Responses <sup>b</sup>	Taxa	Interval	No. Responses <sup>b</sup>	Organization	No. Responses <sup>b</sup>
Habitat Suitability (HSJ-HEP)	5	Birds	(Continued)		Annually	21	Project only	22
Nest survey	5	Bald/golden eagle	2	Mammals	Every 2-5 yrs	7	State only	7
Nest site availability	5	Turkey	2	Deer/mule deer	Every 6+ yrs	4	Both above	1
Field Investigation	5 <sup>c</sup>	Waterfowl	2	Game animals		—	USFWS <sup>f</sup>	1
Forest inventory	2	Quail/California quail	2	Rabbit	Total Responses	32	Volunteer	1
WHAG <sup>d</sup>	2	Bluebird	1	Squirrel				
Annual Inspection of Conditions	1	Downy woodpecker	1				Total Responses	32
Cover	1	Grouse	1					
Forage survey	1	Osprey	1	Others				
OMP compartment survey <sup>e</sup>	1	Western meadowlark	1	All species				
Range condition survey	1	Wood duck	1	General biota				
Transit line survey	1	Yellow warbler	1	Native species				
Visual survey	1	Nongame birds	1	Grasses				
Nest box survey	1		—	Selected species				
	—		16					
Total Responses	32							
				Total Responses				
				32				

<sup>a</sup> Approximately half the responses to this question identified population, recruitment, harvest surveys instead of habitat surveys. These responses were either deleted or added to responses given to questions Q44b, Q44c, or Q44d, as appropriate.

<sup>b</sup> Seventeen of 62 projects surveyed reported at least one annual or periodic population survey.

<sup>c</sup> One project gave this response for each of 5 species. These responses may have indicated species population surveys instead of habitat surveys.

<sup>d</sup> WHAG refers to Wildlife Habitat Appraisal Guide methodology

<sup>e</sup> OMP refers to Operational Management Plan

<sup>f</sup> USFWS refers to U.S. Fish and Wildlife Service

Table 31. Use of models for terrestrial habitat assessment and monitoring on surveyed projects (Q45 and Q46).

Summary of Habitat Suitability Models (HSI) In Use (Q45)									
Models In Use (Q46)			Source of Model			Target Species			
Type	No. Projects		Source	No. Responses		Species	No. Responses	Species	No. Responses
HSI <sup>a</sup>	6		Modified Bluebook <sup>c</sup>	11		Birds		(Continued)	
WHAG <sup>b</sup>	2		Bluebook <sup>c</sup>	8		California quail	2	Mammals	
Deer mgt. model	1		Custom	4		Downy woodpecker	2	Black-tailed deer	1
Unidentified model	1		Unspecified	1		Mallard	2	Deer-unspecified	1
	—			—		Yellow warbler	2	Mule deer	1
Total Projects	10		Total Projects	24		Barred owl	1	River otter	1
						Canada goose	1	Rocky Mountain elk	1
						Chukar	1		—
						Marsh wren	1		5
						Pheasant	1		
						Song sparrow	1	Unspecified Others	11
						Spotted owl	1		
						Western meadowlark	1		—
						Wood duck	1	Total Projects	32
							—		
							17		

<sup>a</sup> Habitat Suitability Index

<sup>b</sup> Wildlife Habitat Appraisal Guide

<sup>c</sup> Refers to HSI species models published by the US Fish and Wildlife Service.

Table 32. Most important game species hunted on Corps projects (Q42).

Taxa	No. Responses <sup>a</sup>	Importance (1 - 10 scale)			Species Reported (No. Projects)
		Min	Max	Mean	
Waterfowl	27	1	10	6.7	waterfowl (16), ducks (4), mallard (2), geese (2), Canada goose (1), wood duck (1), teal (1)
Upland Game Birds					
Turkey	37	2	10	6.2	turkey (30), wild turkey (5), eastern turkey (1), Rio Grande turkey (1)
Quail/Partridge	28	1	9	4.6	quail (14) bobwhite (6), chukar (3) California quail (3), Hungarian partridge (1), partridge (1)
Pheasant	17	5	9	7.4	pheasant (12), ring-necked pheasant (5)
Grouse	11	1	7	3.6	grouse (6), ruffed grouse (4), greater prairie chicken (1)
Dove	7	3	10	6.4	dove (5), mourning dove (2)
Woodcock	4	3	9	5.3	woodcock (4)
Big Game					
Deer	55	1	10	6.1	deer (27), white-tailed deer (22), mule deer (4), black-tailed deer (2)
Bear	3	1	8	3.3	bear (2), black bear (1)
Elk	2	1	3	2.0	Rocky Mountain elk (1), Roosevelt elk (1)
Cougar	2	1	1	1.0	cougar (2)
Small Game					
Rabbit	32	1	10	5.5	rabbit (24), cottontail rabbit (4), eastern cottontail (2), swamp rabbit (2)
Squirrel	27	2	10	6.1	squirrel (18), gray squirrel (5), fox squirrel (2), red squirrel (2)
Unspecified	2	4	5	4.5	small game (2)
Others					
Furbearers	4	2	5	3.8	furbearers (4)
Raccoon	3	1	10	6.0	raccoon (3)
Feral hog	2	8	9	8.5	pig (2)
Unspecified	2	3	6	4.5	upland (1), upland game (1)

<sup>a</sup> Fifty-five responding projects gave 265 total responses. Respondents were asked to list and rate the importance of (up to) the 5 most important species hunted on their project; individual projects provided from 0 to 9 species, most listed 5.

Table 33. A summary of hunter harvest surveys performed on Corps projects (Q44d).

Harvest Survey Method		Species/Taxa Surveyed		Frequency of Survey		Participating Agency	
Method	No. Responses <sup>a</sup>	Taxa	No. Responses <sup>a</sup>	Interval	No. Responses <sup>a</sup>	Agency	No. Responses <sup>a</sup>
Check station <sup>b</sup>	19	Deer	21	Annually	53	State	38
Mail survey <sup>c</sup>	10	Turkey	9	Every 2-5 yrs	3	Corps Project	7
Field/bag check	9	All <sup>e</sup>	6	Every 6+ yrs	0	Both Of Above	1
Harvest card	1	Waterfowl	4		—	USFWS <sup>f</sup>	3
Windshield survey	1	Furbearers	3	Total Responses	56		—
Quota hunt	1	Bear	2				49
Others <sup>d</sup>		Big game	2				
Volunteers	3	Upland game	2				
Hunter success	3	Beaver	1				
Harvest survey	2	Elk	1				
Hunter survey	2	Fox	1				
Trapper report	1	Rabbit	1				
Post-season survey	1	Squirrel	1				
	—	Pheasant	1				
Total Responses	54	Canada geese	1				
		Total Responses	56				

<sup>a</sup> Twenty-five of 62 surveyed projects reported one or more harvest surveys each.

<sup>b</sup> Does not distinguish between manned and unmanned (voluntary survey) check stations.

<sup>c</sup> Does not distinguish a scientific mail survey of licensed/permitted hunters and a less formal mail-back of harvest cards distributed to hunters at permit stations or in the field.

<sup>d</sup> Survey method not identifiable.

<sup>e</sup> Indicates that all hunted species are included in harvest survey(s).

<sup>f</sup> US Fish and Wildlife Service.



Table 34. Animal damage control efforts on Corps projects (041).

Selected Animal Damage Control Measures				Species/Taxa of Nuisance Animals Reported			
Animal Control Measures	No. Projects	Trend Over Next 10 Years		Taxa	No. Responses	Taxa	No. Responses
		Decrease	Same Increase				
Nuisance wildlife control	30	1	12	Mammals		(Continued)	
Feral dog/cat control	19	1	8	Nuisance dog/cat	19	Waterfowl	
Population reduction hunts	11	0	6	Beaver	15	Geese/Canada geese	11
Predator control	7	0	3	Deer	10	Waterfowl	2
	—			Raccoon	4	Domestic waterfowl	1
				Coyote	3	Ducks	1
				Feral hog	2	Mute swan	1
				Prairie dog	2		—
				Skunk	2		16
				Woodchuck	2	Other Birds	
				Burrowing rodents	1	Turkey	2
				California ground squirrel	1	Ring-billed gull	1
				Cougar	1	Rock dove / pigeon	2
				Furbearers	1	Starling	1
				Ground squirrel	1	Vulture	1
				Mammals	1		—
				Moles	1		7
				Yellow-bellied marmot	1	Other	
				Rabbit	1	Upland game	1
				Rats	1		
Total Projects Responding	42				69	Total Responses	93

<sup>a</sup> Most commonly listed species on the increase were beaver (9), geese (5), and raccoon (4).

Table 35. Project ratings of the significance of selected natural resources occurring on Corps projects (Q9).

Natural Resource	No. Projects Responding	Mean Significance <sup>a</sup>	
		Local	Regional
Habitats			
aquatic areas	61	7.9	7.5
riparian corridors	61	6.9	6.5
wetland	60	6.7	6.5
forestland	58	6.4	6.0
openland	59	5.2	4.9
scrub/shrub	59	5.0	4.7
agricultural land	54	4.0	3.5
native prairie	46	3.2	2.9
Biota			
warmwater fishes	57	8.2	7.5
upland game species	61	7.4	6.5
waterfowl	61	6.9	6.1
nongame species	61	6.5	5.9
T&E species	60	5.7	5.6
coldwater fishes	54	5.0	4.9
furbearers	60	4.5	3.9
sensitive plants	57	4.2	3.9

<sup>a</sup> Assigned ratings ranged from 1 (least important) to 10 (most important).

Table 36. Importance of selected aquatic resource management concerns (Q48).

Selected Concern	Current Importance <sup>a</sup>				Importance During Next 10 Years <sup>a</sup>			
	No. Projects	Min	Max	Mean	No. Projects	Min	Max	Mean
Water quality	61	1	10	7.6	56	3	10	8.4
Condition of fishery	60	1	10	7.6	56	1	10	8.0
Pollution/contamination	61	0	10	6.3	56	0	10	7.1
Siltation/sedimentation	61	0	10	6.3	55	1	10	5.4
Shoreline erosion	60	0	10	5.3	55	0	10	6.4
User group conflicts	60	0	10	4.4	57	0	10	5.9
Boater crowding	60	0	10	4.2	57	0	10	6.0
Nuisance aquatic plants	59	0	10	2.0	56	0	10	2.4
Others								
bank/channel issues	1	10	10	10.0	1	10	10	10.0
dredged material disposal	1	10	10	10.0	1	10	10	10.0
waterfowl/shoreline issues	1	8	8	8.0	1	8	8	8.0
zebra mussels	2	6	8	7.0	2	8	8	8.0
water supply	1	6	6	6.0	1	8	8	8.0

<sup>a</sup> Rating of importance ranged from 0 (not important) to 10 (very important).

Table 37. Importance of selected aquatic resource issues to project operations (Q49).

Resource Issue	No. Projects Responding	Importance <sup>a</sup>			Projects Indicating A Concern			
		Min	Max	Mean	No. Projects	Up-stream	Within Project	Down-stream
Water fluctuations	62	0	10	8.1	58	17	51	37
Fishery considerations	62	0	10	7.3	60	15	56	39
Water quality	62	0	10	6.7	57	11	45	37
Siltation	62	0	10	5.9	60	12	56	20
Shoreline erosion	62	0	10	5.6	56	7	50	22
Resource use conflicts	62	0	10	5.6	58	10	52	16
Pollution/contamination	62	0	10	4.4	49	11	38	24
Others								
dredged material disposal	1	10	10	10.0	1	0	1	0
water supply	3	7	10	9.0	3	0	0	3
water temperature	1	8	8	8.0	1	0	0	1
bank stabilization	1	8	8	8.0	1	0	1	0

<sup>a</sup> Rating of importance ranged from 0 (not important) to 10 (very important).

Table 38. A summary of restrictions on project operations intended to accommodate recreation and natural resource concerns (Q50).

Type Of Restriction Reason	No. Projects Responding
Minimum Release	
fisheries	16
water quality	4
mussels	2
water supply	1
reason not specified	6
	—
	24
Seasonal pool levels	
fisheries	6
recreation	5
waterfowl	3
	—
	11
Maximum Release Rate	
shoreline erosion	2
Reduced Hydropower Production	
fisheries	1
Periodic Releases	
rafters	1
Total Projects Responding	34

Table 39. Conflicts associated with use and management of aquatic resources (Q53).

Nature of Conflict	No. Projects Responding	Severity <sup>a</sup>			No. Anticipating Change In Next 10 years	
		Min	Max	Mean	Decrease	Same Increase
Recreation vs Recreation						
fishers vs boaters	22	2	10	5.3	0	8 13
personal watercraft vs all others	18	4	10	6.7	0	0 18
powered boats vs nonpowered boats	2	7	7	7.0	0	0 2
miscellaneous others	16	-	-	-	-	-
	—					
	38					
Operations vs Natural Resource Management						
hydropower vs fisheries	7	5	10	8.0	1	3 2
flood control vs fisheries	6	5	10	6.8	0	3 3
water level management vs fisheries	2	5	10	7.5	0	2 0
miscellaneous others	11	-	-	-	-	-
	—					
	15					
Operations vs Recreation						
flood control vs recreation	8	3	9	6.5	0	7 1
commercial shipping vs recreational boaters	3	4	4	4.0	0	1 2
water level management vs recreation	2	8	10	9.0	0	1 1
irrigation vs recreation	2	8	8	8.0	0	0 2
hydropower vs recreation	2	4	6	5.0	0	1 1
miscellaneous others	3	-	-	-	-	-
	—					
	15					
	—					
Total Projects Responding	47					

<sup>a</sup> Severity based on a rating from 1 (low) to 10 (very high).

Table 40. Summary of water-related health advisories issued on Corps projects (054).

Advisory	No. Projects Responding	No. Projects with Advisories		Reason for Advisory	
		Ever Issued	Now In Effect	Cause	No. Projects
Eating fish	62	17	7	heavy metals dioxin pesticides others	5 3 2 2
Swimming	62	24	2	coliform biol. contaminants medical waste heavy metals high water	19 1 1 1 1
Drinking water	3	3	1	coliform	3
Total Projects	62	35	9		

Table 41. Trends in nuisance species of aquatic plants and animals reported by Corps projects (852).

Nuisance Species	No. Projects <sup>a</sup>	Trend Over Last 10 Years (Number of Projects)		Anticipated Trend In 10 Years (Number of Projects)	
		Decreasing	Same Increasing	Decreasing	Same Increasing
Animals					
Zebra mussels <sup>b</sup>	7	0	4	0	7
Beaver	4	0	3	0	4
Canada geese	2	0	2	0	2
Nutria	1	0	0	0	1
Squawfish	1	0	1	0	1
Common carp	1	0	0	0	0
Plants					
Eurasian watermilfoil	5	0	3	0	3
Hydrilla	3	0	2	0	3
Purple loosestrife	3	0	3	0	2
Water celery	2	0	2	0	2
Water hyacinth	2	0	2	0	2
Algae	1	0	0	0	0
Coontail	1	0	1	0	1
Phragmites	1	0	0	0	0
	—		1		1
	24				

<sup>a</sup> Geographical note: 23 of 34 total responses were from NCD(9), SAD(8), and SWD(6).

<sup>b</sup> Geographical note: concerns about zebra mussels were reported by NCD(3), SWD(2), ORD(1) and LMVD(1).



Table 42. Availability of fishery management data for Corps projects (Q55c and Q55d).

Availability of Fishery Management Surveys at Projects (Q55c)									
Type Of Survey	No. Projects Responding	No. of Projects Reporting Projects				Creel Survey Summary (Q55d)			
		Annually	Every 2-3 Years	Every 4-6 Years	Every 7+ Years	Information reported	No. Projects Responding		
Electroshock	44	26	9	5	4	Catch per unit effort	29		
Creel	34	13	4	7	10	Harvest estimates	25		
Gill net	32	21	6	1	4	Length-weight statistics	23		
Rotenone	16	6	3	3	4	Fisher attitudes/opinions	18		
Trap net	6	4	1	1	0	Trip expenditures	5		
Other methods	4	2	0	1	1		—		
Total Projects	54					Total Projects Responding	34		

Table 43. Participation of Corps projects in the collection and analysis of sport fishery management data (Q55e).

Activity	No. Projects Responding	Responsible Agency (Number of Projects)				Corps Funding (No. Projects)		Corps Personnel (No. Projects)	
		Corps	State	Both	Other	Yes	No	Yes	No
Stock assessment data collections	43	1	35	1	0	4	39	9	33
Catch data collections (creel)	40	1	27	2	1	3	36	6	33
Data analysis	38	1	26	2	1	4	33	5	32
	—					—		—	
Total Projects	45					8		14	

Table 44. Acreages of wetlands on Corps projects (q71).

Acreage	No. Projects Reporting		
	Natural Wetlands	Constructed Wetlands	All Wetlands
1 - 10	14	8	12
11 - 100	9	8	12
101 - 1,000	12	9	14
1,001 - 10,000	8	0	8
10,001 - 100,000	2	1	3
undetermined	1	0	1
	---	---	---
Total Projects	46	26	50
Mean Acreage	2,499	679	2,655

Table 45. Availability and status of wetland inventories on Corps projects (Q72, Q73, and Q74).

Availability of a Wetland Inventory (Q72)		Degree of Completion (Q74)			Thoroughness of Inventory (Q73)	
Response	No. Projects Responding	No. of Projects			Response	No. Projects Responding
		Percent Completion	Presently	In Next 5 Years		
No	41	0	6	5	Thorough in all wetlands	4
Yes	20	1- 20	4	3	Thorough in selected wetlands.	1
	—	21- 40	0	0	Cursory surveys only	14
Total Projects	61	41- 60	6	4	Details of available survey unknown	1
		61- 80	2	4		—
		81-100	12	14	Total Projects Responding	20
		Total	30	30		

Table 46. Classification methods (Q75) and personnel (Q76) used in wetland inventories on Corps projects.

Wetland Classification Methods Used (Q75)		Inventory Personnel (Q76)		Use of a Certified Wetland Delineator (Q76)	
Method	No. Responses	Affiliation	No. Responses <sup>e</sup>	Response	No. Projects Responding
Informal methods	12	USFWS <sup>f</sup>	18	No	7
National Wetland Inventory <sup>a</sup>	10	Corps Project	16	Yes	5
CE Wetland Delineation Manual <sup>b</sup>	5	Corps District	14	Don't Know	10
Shaw and Fredine (1956)	0	State	12		—
Others	3 <sup>c</sup>	WES	6	Total Projects	22
	—	Others	3		
Total Responses	28 <sup>d</sup>		—		
		Total Responses	69		

<sup>a</sup> Cowardin *et al.* (1979).

<sup>b</sup> Environmental Laboratory (1987).

<sup>c</sup> Surveys conducted by other agencies using unknown methods

<sup>d</sup> Some projects reported using more than one method

<sup>e</sup> Several wetland inventory efforts involved personnel from 2 or more agencies.

<sup>f</sup> Includes USGS National Biological Service (NBS) and USGS Biological Resources Division (BRD).

Table 47. Perceived importance of selected wetland management objectives (Q78) and practices (Q80) on Corps projects.

Wetland Management Objectives (Q78)							Wetland Management Practices (Q80)					
Selected Management Objectives	No. Projects Responding	Present Importance			Future Importance			Potential Management Practices	No. Projects Responding	Importance		
		Min	Max	Mean	Min	Max	Mean			Min	Max	Mean
Waterfowl	50	0	10	6.5	0	10	7.0	Nesting structures	50	0	10	5.3
Biodiversity	50	0	10	5.3	0	10	6.1	Vegetation management	44	0	10	4.9
Nongame wildlife	50	0	10	5.0	0	10	5.8	Moist soil management	44	0	10	4.0
T&E species	49	0	10	4.2	0	10	5.0	Reservoir water levels	45	0	10	3.9
Furbearers	50	0	10	4.2	0	10	4.5	Agricultural food plots	46	0	10	3.6
Fish spawning	50	0	10	3.6	0	10	4.3	Beaver pond management	46	0	10	2.9
Buffer zones	50	0	10	3.3	0	10	4.0	Buffer zone management	43	0	10	2.8
Vector control	50	0	10	1.7	0	10	1.8	Greentree reservoirs	41	0	10	2.5
Wastewater treatment	50	0	10	1.1	0	10	1.6	Artificial potholes	44	0	10	2.5
								Prescribed burning	41	0	10	2.1

Table 48. Summary of wetland types and target species or groups featured in wetland management programs on Corps projects (Q79).

Featured Wetlands		Featured Taxa or Species	
Wetland Type	No. Projects Reporting	Taxa/Species	No. Projects Reporting
Freshwater marsh	20	Birds	
Beaver pond	19	wood duck	26
Riparian areas	9	waterfowl	23
Moist soil areas	6	Canada goose	8
Ponds	6	mallard	5
Bottomland hardwoods	5	shorebirds	3
Potholes	5	dabbling ducks	2
Slough	3	geese	2
Reservoir margin	2	songbirds	2
Greentree reservoir	2	bald eagle	2
Flooded agriculture	1	herons	1
Mudflat	1	snow goose	1
Reservoir	1	swans	1
Salt marsh	1	pelican	1
Seasonally flooded areas	1	hooded merganser	1
Swamp	1	teal	1
		black duck	1
		coot	1
		egrets	1
		woodcock	1
		snipe	1
		red-winged blackbird	1
		pheasant	1
		neotropical birds	1
		prothonotary warbler	1
		quail	1
		red-shouldered hawk	1
		Mammals	
		beaver	5
		furbearers	4
		muskrat	4
		river otter	3
		nongame animals	3
		bats	1
		mink	1
		fox	1
		Fishes	
		fish	2
		brown trout	1
		brook trout	1
		rainbow trout	1
		Reptiles	
		snapping turtle	2
		painted turtle	1
		Amphibians	
		four-toed salamander	1
		bullfrog	1
		grass frog	1
		green frog	1

Table 49. Trends concerning the infestation of project wetlands with nuisance plants and animals (Q82).

Wetland Nuisance Species	No. Projects Responding	Trend In Last 10 Years (No. of Projects)			Trend In Next 10 Years (No. of Projects)		
		Decrease	Same	Increase	Decrease	Same	Increase
Animals							
beaver	4	0	1	3	0	1	3
Canada goose	3	0	0	3	0	1	2
nutria	1	0	1	0	0	0	1
zebra mussel	1	0	0	1	0	0	1
Plants							
purple loosestrife	5	0	0	3	0	0	4
cocklebur	2	0	2	0	1	1	0
bulrush	1	0	1	0	0	1	0
cattail	1	0	0	1	0	0	1
daphnia	1	0	0	1	0	0	1
duckweed	1	1	0	0	1	0	0
phragmites	1	0	0	1	0	0	1
thistle	1	0	1	0	0	1	0
waterhyacinth	1	0	1	0	0	1	0
willow	1	0	1	0	1	0	0
Total Projects		19					



Table 50. Anticipated land use changes along project boundaries that may affect project wetlands during the next 10 years (Q83).

Changes Along Property Boundaries		Effect on Project Wetlands	
Description	No. Projects Responding	Description	No. Projects Responding
Urban/housing development	14	Increased siltation	12
Logging	4	Increased pollution	3
More/changing agriculture	4	Reduced water quality	3
Channelization	1	Increase in runoff water	3
Increased erosion	1	Wetland encroachment	2
Grazing practices	1	Habitat changes	2
Industrial discharge	1	Improved wetland buffer	1
Mining	1	Wetland destruction	1
Less agriculture	1	Reduction in runoff water	1
	—		—
	20		20

Table 51. Species reported by project personnel as Federally listed threatened, endangered, and candidate species occurring on surveyed projects.

Federally Listed Threatened and Endangered Species <sup>a</sup> (Q59a)				Federal Candidate Species <sup>a</sup> (Q59b)			
Taxa	No. Projects <sup>b</sup>	Taxa	No. Projects <sup>b</sup>	Taxa	No. Projects <sup>b</sup>	Taxa	No. Projects <sup>b</sup>
Birds		(Continued)		Birds		(Continued)	
Bald eagle	38	Invertebrates		Bald eagle	1	Reptiles/Amphibians	
California condor	1	Higgins' eye pearlymussel	2	Black-shouldered		Foothills yellow-	
Eagle (unspecified)	1	Brookfloater mussel	1	kite	1	legged frog	1
Golden eagle	1	Rough pigtoe	1	Burrowing owl	1	Red-legged frog	1
Interior least tern	2	Cumberland bean pearlymussel	1	Cooper's hawk	1	Southwestern pond	
Least tern	2	Heavy pigtoe	1	Double-crested		turtle	1
Northern spotted owl	1	Dromedary pearlymussel	1	cormorant	1	Texas horned lizard	1
Osprey	2	Eastern pearly shelled mussel	1	Marsh hawk	1		
Peregrine falcon	7	Green-blossom pearlymussel	1	Red-shouldered			3
Piping plover	3	Orange-foot pimple back		hawk	1	Plants	
Whooping crane	2	pearlymussel	1	White pelican	1	Short's bladderpod	1
	—	Purple cat's paw pearlymussel	1		—	Snuffbox	1
	43	White wartyback pearlymussel	1		4	Spectaclecase	1
Fish		Yellow blossom pearlymussel	1	Fish		Spiny-seped coyote	
Chinook salmon	2	Pink mucket pearlymussel	1	Alabama sturgeon	1	thistle	1
Fall chinook salmon	1	Cumberlandian combshell	1	Blue shiner	1	Svenson's wild rye	1
Sockeye salmon	1	Southern combshell	1	Bull trout	4	Water stitchwort	1
Goldline darter	1	Black chubshell	1	Chinook salmon	2	Harper's umbrella	
Leopard darter	1	American burying beetle	1	Crystal darter	1	plant	1
Neosho madtom	1		—	Dirty darter	1	Mohlenbrocks umbrella	
Roanoke logperch	1		7	Blue sucker	1	plant	1
Snake River sockeye		Mammals		Paddlefish <sup>c</sup>	1	Shaved sedge	1
salmon	1	Northern monk seal	1	Pallid sturgeon <sup>d</sup>	1		—
	—	Gray bat	1	Wild steelhead	1		3
	6	Indiana bat	1		—	Invertebrates	
Plants		Nelsons antelope	1		8	Armored rocksnail	1
Yellow lady's		Ground squirrel	1	Mammals		Molestan blister	
slipper	1		—	Eastern woodrat	1	beetle	1
Bay star vine	1		3	Indiana bat	1	Muddy rocksnail	1
Kaweah brodiaea	1	Reptiles/Amphibians		Kangaroo rat	1	Ornate rocksnail	2
California Valley		Red Hills salamander	1		—	Southern chubshell <sup>e</sup>	1
elderberry	1	American alligator	1		3	Pugnose rocksnail	1
Hoods milkweed	1	Ornate box turtle	1				—
Pink lady's slipper	1		—				3
Price's potato bean	1		3				
Western wall flower	1						
Winged mapleleaf	1						
<u>Aster vialis</u>	1						
	—						
	6						

<sup>a</sup> Some of these species are not Federally listed, but for reporting purposes are included as reported by respondents.

<sup>b</sup> A total of 45 projects listed one more threatened or endangered species; 12 listed one or more candidate species,.

<sup>c</sup> Reported by project as Polydon spathula.

<sup>d</sup> Reported by project as Scaphirhynchus spp.

<sup>e</sup> Reported by project as Pleurobema decisum.

Table 52. Progress in conducting inventories on Corps projects for Federally listed threatened and endangered species projects (Q57, Q58b, and Q58d).

Initiation of Species Inventories (Q57)		Overall Completion (Q58d)			Inventory Participants (Q58a)	
Response	No. Projects Responding	Percent Completion	No. of Projects		Organizations	No. Projects Responding
			Presently	In Next 10 Years		
Yes	37	1- 20	10	5	State agency	28
No	24	21- 40	4	4	U.S. Fish and Wildlife Service	20
	—	41- 60	3	5	Corps project personnel	16
Total	61	61- 80	5	4	Corps division/district personnel	12
		81-100	8	12	University	12
		Total	—	—	Private Consultant	10
			30	30	The Nature Conservancy	4
					National Marine Fisheries Service	1
					Miscellaneous others	5
					Total Projects Responding	39

Table 53. Thoroughness of inventories that have been conducted for threatened and endangered species on Corps projects (Q58b and 58c).

Overall Thoroughness of Inventories (Q58b)		Inventories by Major Taxa- No. of Projects (Q58c)				
Response	No. Projects Responding	Taxa <sup>a</sup>	No. Projects Responding	Species		Candidate Species
				Some	Partial Complete	
Comprehensive inventory of all species	10	Birds	35	20	15	23
Thorough inventory of selected species	15	Fish	24	14	9	16
Cursory Inventory	16	Mammals	18	11	7	12
	—	Invertebrates	22	14	7	11
	41	Plants	21	12	9	15
		Reptiles/Amphibians	19	13	6	12
		State-listed species	23	14	9	16
		Total Projects	42			32

<sup>a</sup> Refers to federally listed taxa unless otherwise indicated.

Table 54. Status of inventory and management efforts on Corps projects directed at critical habitats of federally listed threatened and endangered species (Q58c and Q63).

Inventories of Critical Habitats (Q58c)				Management of Critical Habitats <sup>a</sup> (Q63)			
Conducted on Project		General Status		Effort Directed at Critical Habitats		Species For Which Critical Habitats Are Managed	
Response	No. Projects Responding	Condition	No. Projects Responding	Response	No. Projects Responding	Taxa	No. Projects Responding
Yes	22			Some	17	Birds	
No	39	Include all species	12	None	44	Bald eagle	5
	—	Include some species	10		—	Indiana bat	3
Total	61	Partially finished	13	Total	61	Gray bat	1
		Completely finished	8			Least tern	1
		Includes candidate species	17			Peregrine falcon	1
			—			Piping plover	1
		Total Projects	22			Fish	
						Anadromous fish	1
						Neosho madtom	1
						Reptiles/Amphibians	
						Ornate box turtle	1
						Invertebrates	
						Higgin's eye pearl mussel	1
						Plants	
						Running buffalo clover	1

<sup>a</sup> Species are listed as reported by respondents.

Table 55. Availability of guidance to Corps projects on the management of threatened and endangered species (Q60 and Q61).

T&E Species Addressed In Project OMP? <sup>a</sup> (Q60)		Other Sources of Guidance (Q61)	
Response	No. Projects Responding	Available Resources	No. Projects Responding
Yes	48	Reference material on threatened and endangered species	26
No	10	Personnel and/or expertise from other agencies/organizations	21 <sup>b</sup>
Total	58	Current Management Plan	20
		Access to formal training	8
		Total Projects Responding	— 39

<sup>a</sup> T&E = Threatened and Endangered; OMP = Operational Management Plan.

<sup>b</sup> Nineteen of 21 projects utilizing endangered species personnel or expertise from other agencies most often sought assistance from state agencies (14) and/or the U.S. Fish and Wildlife Service (13).

Table 56. Ongoing monitoring activities associated with threatened, endangered, and sensitive species on Corps projects (Q62).

Monitoring Activity (No. of Projects)				Monitoring Activity (No. of Projects)					
Taxa <sup>a</sup>	No. Projects Reporting <sup>b</sup>	Popu- lation	Habi- tat	Recruit- ment	Taxa <sup>a</sup>	No. Projects Reporting <sup>b</sup>	Popu- lation	Habi- tat	Recruit- ment
Birds									
Bald Eagle	25	25	3	8	Mussel (unspecified)	1	1	1	1
Golden Eagle	1	1	1	1	Higgins' Eye Pearlymussel	1	1	1	1
Interior Least Tern	1	1	-	1		-	-	-	-
Least Tern	1	1	1	-		2	2	2	2
Peregrine Falcon	2	1	-	-	Reptiles/Amphibians				
Red-Shouldered Hawk	1	1	1	1	Ornate Box Turtle	1	1	1	-
Piping Plover	2	2	2	-	Red Hills Salamander	1	-	1	-
	-	-	-	-		-	-	-	-
	27	26	6	8		2	1	2	-
Fish									
Chinook Salmon	2	1	-	1	Plants				
Neosho Madtom	1	1	-	-	Meads Milkweed	1	1	-	-
Roanoke Logperch	1	1	-	-	<u>Aster vialis</u>	1	1	1	1
Anadromous Fishes	1	-	-	-	Prices Potato Bean	1	1	1	1
Sockeye Salmon	1	1	-	-	Western Wall Flower	1	1	-	-
	-	-	-	-		-	-	-	-
	4	3	0	1		3	3	2	2

<sup>a</sup> Species are listed as reported by respondents.

<sup>b</sup> A total of 30 projects reporting monitoring activity; totals may be less than the column sum because some projects reported more than one monitoring activity.

Table 57. Activities substantially affecting the management of endangered, threatened, and sensitive species on Corps projects (Q64 and Q65).

On-Project Activities Affecting or Affected By Threatened and Endangered Species (Q64)			Off-Project Activities Affecting The Management Of Threatened and Endangered Species (Q65)		
Selected Activity		Affected Species <sup>a</sup>		Taxa Affected <sup>a</sup>	
Category	No. Projects Responding	Affected Species	No. Projects Responding	Category	No. Projects Responding
Visitor recreation	11	Birds		Logging	3
Project operations	12	Bald eagle	11	Development	3
Natural resource	6	Piping plover	2	Forest management	1
management	—	Least tern	2	Agricultural drainage	1
Total Projects	17	Golden eagle	1	Habitat loss	1
		Red-shouldered hawk	1		—
				Total Projects	7
		Fishes			
		Salmon spp.	3		
		Neosho madtom	1		
		Mammals			
		Gray bat	2		
		Indiana bat	2		
		Invertebrates			
		Brookfloater mussel	1		
		Higgin's eye pearl mussel	1		
		Dwarf red mussel	1		
			—		
		Total Projects	17	Total Projects	7

<sup>a</sup> Species are listed as reported by respondents.



Table 58. Agency responsibility for management of Federally listed threatened and endangered species on the natural resource outgrants of Corps projects (Q69a and Q69b).

Specification of T&E Responsibilities in Lease (Q69a)		T&E Activities on Outgrants (Q69b)							
		Occurrence On Outgrant (No. of Projects)			Responsible Agency (No. of Projects)			Don't Know	
		Activity	Yes	No	Project	Lessee	Both		
Response	No. Projects Responding		Yes	No	Don't Know	Project	Lessee	Both	Don't Know
Yes	16	Inventories	16	9	1	4	11	3	2
No	25	Status surveys	15	9	2	5	12	2	1
	—	Protection and management	16	7	2	6	9	4	1
Total	41								

Table 59. Frequency of consultations by projects with the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service in regard to Federally listed threatened and endangered species (Q67 and Q68).

Informal Endangered Species Consultations (Q67)				Formal Section 7 Consultations (Q68)	
Frequency	Nature of Assistance				
	No. Projects		No. Projects		
Consultations In Last 5 Yrs	Responding	Response		Response	Projects
0	33	Site visit	8	Yes	4
1	12	Screening possible species	15	No	57
2	6	Habitat/Life-history information	9	Total	61
3-5	8	Inventories and/or surveys	8		
6-10	0	Management plan formulation	7		
11+	2	Informal opinion	13		
	--		--		
Total Projects	61	Total Projects	28		

Table 60. A list of formal Section 7 consultations<sup>a</sup> on surveyed Corps projects (Q68).

Division	Project Action	Species Impacted	Year		Jeopardy Opinion?	Outcome
			Initiated	Resolved		
SAD	flood control	Southern combshell <sup>b</sup> Black chubshell <sup>b</sup> Heavy pigtoe <sup>b</sup>	1989	-	yes	project modified
NCD	dike construction	Higgin's eye pearl mussel	1989	1990	no	project modified
NCD	harbor dredging	Higgin's eye pearl mussel	1993	1993	yes	project modified
NPD	not indicated	not indicated	-	-	-	adverse effects mitigated

<sup>a</sup> All reported consultations were with the U.S. Fish and Wildlife Service.

<sup>b</sup> Project provided the scientific names Epioblasma pentia, Pleurobema cortum, and Pleurobema taitianum in reporting these species of mussels.

Table 61. Unmet management needs associated with aquatic resources (Q56), terrestrial resources (Q47), wetland resources (Q84), and threatened and endangered species (Q70).

Aquatic Resources (Q56)			Terrestrial Resources (Q47)			Wetland Resources (Q84)			Threatened and Endangered Species (Q70)		
Response	No. Projects		Response	No. Projects		Response	No. Projects		Response	No. Projects	
Improve fish habitat	13		More manpower/funding	12		Initiate wetland developments	9		Implement surveys	13	
Water level manipulations			Habitat restoration	6		Conduct wetland inventory	7		Initiate habitat management	2	
to benefit fishes	9		Additional habitat management	5		Improve wetland protection	3		Develop management plan	1	
Improve fish mgt practices	6		Habitat preservation	2		Additional wetland management	1		Develop mgt plan for outgrant	1	
Reduce lake sedimentation	5		Control shoreline erosion	2		Wetland restoration	1		Provide staff training	1	
Reduce shoreline erosion	4		Protect from encroachment	2		Initiate waterfowl management	2		Initiate site monitoring	1	
Control nuisance plants	3		Conduct resource inventory	2		Put out nest boxes	1		Species relocation	1	
Control nuisance plants	3		Control exotic species	1		Animal control	1				
More funding	2		Add more grazing land	1		More funding	3				
More manpower	2		Provide more visitor access	1		More manpower	1				
Reduce fish losses at dam	2		Conduct population surveys	1		Better trained personnel	1				
Control zebra mussels	2		Conduct harvest surveys	1							
Others	3		Deploy more nest boxes	1							
Total Responses	52			37			30 <sup>a</sup>			20	
No. Projects Responding	47			37			30			20	

<sup>a</sup> Geographical note: 20 of the 30 responses on wetland resources were from ORD (9), SWD (6), and NED (5).

# **Appendix A**

## **Listing of Corps Projects in the Survey Sampling Frame**

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**Table A1**  
**Listing of Corps Projects in the Survey Sampling Form**

Natural Resource Management System ID Code	Project Name
Lower Mississippi Valley Division	
Combined*	Red River Waterway Pool 1 (B401052) and Pool 2 (B400065)
B302560*	Clarence Cannon Dam and Mark Twain Lake
B407090*	Grenada Lake
B316691*	Lake Shelbyville
B412170*	Lake Greeson
B416370*	Sardis Lake
B419370	Wallace Lake
B404530	DeGray Lake
B319420	Wappapello Lake
B315190	Rend Lake
B413780	Pearl River
Combined	Ouachita-Black Rivers including: Calion Pool (B427042), Jonesville Pool (B400225), Columbia Pool (B400214), Felsenthal Pool (B42043)
B311380	Riverlands - Lower
B400600	Arkabutla Lake
B308040	Riverlands - Illinois
B400105	Bayou Bodcau Reservoir
B405590	Enid Lake
B401730	Lake Ouachita
B302700	Carlyle Lake
B311370	Riverlands - Upper
Missouri River Division	
C120060*	Wilson Lake
C111140*	Milford Lake
C272285*	Bear Creek Lake
C108730*	Kanopolis Lake
C205780*	Cold Brook Lake
C206270*	Lake Francis Case
C203070	Cherry Creek Lake
Combined	Salt Creek Lakes including: Holmes Lake (C260018), Yankee Hill Lake Salt Creek Tributary (C260014), Olive Creek Lake (C260010), Stagecoach Lake (C260013), Conestoga Lake (C260015), Wagontrain Lake (C260012), Twin Lakes (C260016), Bluestem Lake (C260011), Pawnee Lake (C260017), Branched Oak Lake (C260019)
C172276	Longview Lake
Note: Asterisk denotes project selected for inclusion in the sample.	
(Sheet 1 of 11)	

**Table A1 (Continued)****Natural Resource  
Management System  
ID Code****Project Name**

## Missouri River Division (continued)

C110030	Long Branch Lake
C117560	Stockton Lake
C118660	Tuttle Creek Lake
C206400	Lake Sakakawea
C201970	Bowman Halley Lake
C272296	Zorinsky Lake
C108840	Harry S. Truman Dam and Reservoir
C201420	Lake Sharpe
C201068	Snyder-Winnebago
C214120	Pipestem Lake
C103480	Clinton Lake
C114880	Rathbun Lake
C114270	Pomme de Terre Lake
C107540	Hillsdale Lake
C206230	Fort Peck Project
C113920	Perry Lake
Combined	Papio Lakes including: Standing Bear Lake (C25330), Wehrspann Lake (C201066), Glenn Cunningham Lake (C260020)
C116980	Smithville Lake
C203020	Chatfield Lake
C204060	Cottonwood Springs Lake
C206440	Gavins Point Project
C110950	Melvorn Lake
C107330	Harlan County Lake
C172277	Blue Springs Lake
C212960	Lake Oahe
C114280	Pomona Lake

## North Atlantic Division

E501780*	Blue Marsh Lake
E573825*	Francis E. Walter Dam
E101770*	Jennings Randolph Lake
E127023*	Alvin R. Bush - Kettle Creek
E104150*	Cowanesque Lake
E100800*	Aylesworth Creek Lake
E573502	Prompton Lake
E114900	Raystown Lake
E508200	IWW Delaware River To Chesapeake Bay, C + D CANAL

(Sheet 2 of 11)

**Table A1 (Continued)**

Natural Resource Management System ID Code	Project Name
North Atlantic Division (continued)	
E105230	East Sidney Lake
E140102	Tioga-Hammond Lakes
E119900	Whitney Point
E406430	Gathright Dam-Lake Moomaw
E117050	Foster Joseph Sayers Dam
E501340	Beltzville Lake
E100240	Almond Lake
E480301	AIW Albemarle and Ches and Dismal Swamp Canal
E104370	Curwensville Lake
North Central Division	
F411550*	Mississippi River Pools 11-22
F509220*	Lac Qui Parle Lake
Combined*	Illinois Waterway including: Farmdale Dam (F452690) and Illinois Waterway ((F408010)
Combined*	Upper Mississippi River Pools including: St Anthony Falls (F574280), Pool 1 (F573914), Pool 2 (F573915), Pool 3 (F5711450), Pool 4 (F511460), Pool 5 (F511470), Pool 5A (F511530), Pool 6 (F511480), Pool 7 (F573916), Pool 8 (F511500), Pool 9 (F511510), Pool 10 (F511520)
F403910*	Coralville Lake
F505270*	Eau Galle Flood Control Project
F305040	Duluth-Superior Harbor
F514080	Mississippi River Headwaters Project
F308960	Kewennaw Waterway
F416510	Saylorville Lake
F415070	Lake Red Rock
F507640	Homme Lake
F513410	Orwell Lake
F509300	Baldhill Dam Lake Ashtabula
F509390	Lake Traverse
F317660	Sturgeon Bay and Lake Michigan Ship Canal
New England Division	
D018400*	Townshend Lake
D000282*	Black Rock Lake
D010560*	Mansfield Hollow Lake
D000406*	Cape Cod Canal
D006150*	Franklin Falls Dam
D017780*	Surry Mountain Lake

*(Sheet 3 of 11)*



**Table A1 (Continued)****Natural Resource  
Management System  
ID Code****Project Name**

## New England Division (continued)

D000960	Barre Falls Dam
D007280	Hancock Brook Lake
D019690	West Hill Dam
D018160	Thomaston Dam
D001560	Birch Hill Dam
D013450	Otter Brook Lake
D019760	West Thompson Lake
D019780	Westville Lake
D001720	Blackwater Dam
D002180	Buffamville Lake
D018830	Union Village Dam
D005310	Edward Macdowell Lake
D007580	Hodges Village Dam
D003730	Conant Brook Dam
D003650	Colebrook River Lake
D012850	North Hartland Lake
D007700	Hopkinton-Everett Lake
D012900	Northfield Brook Lake
D007680	Hop Brook Lake
D010000	Littleville Lake
D075257	Charles River Natural Valley Storage Project
D000850	Ball Mountain Lake
D018610	Tully Lake
D012870	North Springfield Lake
D009080	Knightville Dam
D005120	East Brimfield Lake

## North Pacific Division

G204080*	Cougar Lake
G410260*	Lucky Peak Lake
G410180*	Lower Granite Lock and Dam
G204020*	Cottage Grove Lake
G311990*	Mud Mountain Dam Project White River
G410920*	McNary Lock and Dam, Lake Wallula
G204400	The Dalles Lock and Dam, Lake Celilo
Combined	Green Peter Lake (G206940) and Foster Lake (G268002)
G208480	John Day Lock and Dam, Lake Umatilla
G172738	Chena River Lakes
G400608	Ice Harbor Lock and Dam, Lake Sacajawea

(Sheet 4 of 11)

**Table A1 (Continued)**

Natural Resource Management System ID Code	Project Name
North Pacific Division (continued)	
G373462	Chief Joseph Dam and Rufus Woods Lake
G210090	Lost Creek Lake
G405090	Dworshak Dam & Reservoir
G205830	Fern Ridge Lake
G207770	Fall Creek Lake
G300200	Albeni Falls Dam and Lake Pend Oreille
G201810	Blue River Lake
G309750	Libby Dam and Lake Koocanusa
G207530	Hills Creek
G204690	Detroit Lake
G204910	Dorena Lake
G409880	Little Goose Lock & Dam, Lake Bryan
G320280	Wynoochee Lake
Combined	Lookout Point Lake (G273101) and Dexter Lake (G279008)
G455120	Mill Creek Lake
G410210	Lower Monumental Lock & Dam, Lake West
G273459	Bonneville Lock and Dam
G272731	Willow Creek
Ohio River Division	
H104810*	Dillon Lake
H303940*	Cordell Hull Dam and Reservoir
H200970*	Barren River Lake
H100280*	Alum Creek Lake
H206960*	Green River Lake
H104520*	Deer Creek Lake
H219200*	West Fork of Mill Creek Lake
H117840*	Sutton Lake
H418730*	Tygart Lake
Combined	Monongahela River Projects including: Locks and Dam 2 (H471478), Locks and Dam 3 (H471491), Locks and Dam 4 (H471492), Lock and Dam 7 (H471497), Point Marion Lock and Dam (H471499), Hilderbrand Lock and Dam (H471504), Morgantown Lock and Dam (H471502), Maxwell Locks and Dam (H410840), Opekiska Lock and Dam (H413360)
H203310	Clarence J. Brown Dam and Reservoir
H320140	Wolf Creek Dam Lake Cumberland
H213730	Patoka Lake
H410400	Mahoning Creek Lake
H310740	Martins Fork Lake
(Sheet 5 of 11)	

**Table A1 (Continued)**

**Natural Resource  
Management System  
ID Code**

**Project Name**

Ohio River Division (continued)

H202720	Carr Fork Lake
H253400	Green River plus 2 locks
H419660	Michael J. Kirwan Dam and Reservoir
H101830	Bluestone Lake
H405150	East Branch Clarion River Lake
H105900	Fishtrap Lake
H410250	Loyalhanna Lake
H401400	Berlin Lake
H207910	Huntington Lake
H308370	J. Percy Priest Dam and Reservoir
H118300	Tom Jenkins Dam and Burr Oak Lake
H101280	Beech Fork Lake
H218010	Taylorsville Lake
H303040	Cheatham Lock and Dam
H304390	Dale Hollow Lake
H403750	Conemaugh River Lake
H210570	Cecil M. Harden Lake
H202060	Brookville Lake
H416700	Shenango River Lake
H409050	Kinzua Dam and Allegheny Reservoir
H212760	Nolin River Lake
H211570	Mississinewa Lake
H117740	Summersville Lake
H104740	Dewey Lake
H114780	R. D. Bailey Lake
H418260	Tionesta Lake
H104580	Delaware Lake
H113570	Paintsville Lake
H309550	Laurel River Lake
H106790	Grayson Lake
H302840	Center Hill Lake
H215930	Salamonie Lake
H208920	Kentucky River plus 4 Locks
Combined	Ohio River-Pittsburg District including: Dashields Locks and Dam (H471457), Emsworth Locks and Dams (H471458), Montgomery Locks and Dam (H471456), New Cumberland Locks and Dam (H413150), Pike Island Locks and Dam (H414010), Hannibal Locks and Dam (H407290)
H108550	John W. Flannagan Dam and Reservoir
H105190	East Lynn Lake
H112710	North Fork Of Pound River Lake
H404280	Crooked Creek Lake

(Sheet 6 of 11)

**Table A1 (Continued)**

Natural Resource Management System ID Code	Project Name
Ohio River Division (continued)	
H420190 Combined	Woodcock Creek Lake Ohio River-Louisville District including: Lock and Dam 53 (H276115), Lock and Dam 52 (H276114), Newburgh Lock and Dam (H212560), McAlpine Lock and Dam (H210880), Markland Lock and Dam (H210690), Cannelton Lock and Dam (H202550), Smithland Lock and Dam (H216950), Uniontown Lock and Dam (H218840)
Combined	Ohio River-Huntington District including: Willow Island Locks and Dam (H120000), Robert C. Byrd Locks and Dam (H106310), Belleville Locks and Dam (H101300), Greenup Locks and Dam (H107020), Racine Locks and Dam (H114810), Capt. Anthony Meldahl Locks and Dam (H102680)
H202130	Buckhorn Lake
H411870	Mosquito Creek Lake
H112690	North Branch Kokosing River Lake
H313280	Old Hickory Lock and Dam
H202350	Caesar Creek Lake
H211770	Monroe Lake
H215610	Rough River Lake
H420380	Youghiogheny River Lake
Combined	Muskingum River Lakes including: Pleasant Hill Lake (H171148), Clendening Lake (H171142), Tappan Lake (H171159), Mohicanville Dam (H171146), Atwood Lake (H171138), Piedmont Lake (H171147), Charles Mill Lake (H171141), Wills Creek Lake (H120010), Senecaville Lake (H171149), Leesville Lake (H175047), Dover Dam (H171143), Mohawk Dam (H122190), Beach City Lake (H175046), Bolivar Dam (H171140)
H113550	Paint Creek Lake
H102270	Burnsville Lake
H202360	Cagles Mill Lake
H418790	Union City Dam
H205180	William H. Harsha Lake
H300940	Barkley Lock and Dam Lake Barkley
H202780	Cave Run Lake
H417580	Stonewall Jackson Lake
South Atlantic Division	
K719220*	W. Kerr Scott Dam and Reservoir
K713990*	Philpott Lake

(Sheet 7 of 11)

**Table A1 (Continued)**

Natural Resource Management System ID Code	Project Name
South Atlantic Division (continued)	
Combined*	Tennessee Tombigbee Waterway including: Aliceville (K501039), Gainesville (K501038), Aberdeen (K501041), Canal Section (K501042), Bay Springs (K501091), Columbus (K501040)
K502730*	Carters Lake
Combined*	Alabama River Lakes including Claiborne Lake (K503390), Dannelly Lake (K511220), Woodruff Lake (K08590)
K708350*	John H. Kerr Dam and Reservoir
Combined	Walter F. George Lake (K519190) and George W. Andrews Lake (K551270)
K513220	Okatibbee Lake
K306090	Four River Basins
K705800	Falls Lake
K502200	Lake Sidney Lanier
K712410	B. Everett Jordan Dam and Lake
K618530	Richard B. Russell Dam and Lake
K508450	Lake Seminole
K607380	Hartwell Lake
K313240	Lake Okeechobee and Waterway
K568001	Black Warrior and Tombigbee Lakes
K519710	West Point Lake
K603350	J. Strom Thurmond Lake
K500220	Allatoona Lake
South Pacific Division	
L201600*	Black Butte Lake
L218090*	Lake Kaweah
Combined*	L.A. County Drainage Area including Hanson Lake (L175234), Santa Fe Dam (L100761), Sepulveda Dam (L175232), Whittier Narrows Dam (L174743)
L204990*	Lake Sonoma
L113560*	Painted Rock Dam
L274645*	Lake Mendocino
L212460	Stanislaus River Parks
L111700	Mojave River Dam
L205580	Harry L. Englebright Lake
L268004	Eastman Lake
L175313	Salinas Dam Santa Margarita Lake
L100190	Alamo Lake

(Sheet 8 of 11)

**Table A1 (Continued)**

Natural Resource Management System ID Code	Project Name
South Pacific Division (continued)	
Combined	Santa Ana River Projects including: Fullerton Dam (L174729), Carbon Canyon Dam (L174727), Brea Dam (L174726), Prado Dam (L174732)
L210750	Martis Creek Lake
L214040	Pine Flat Lake
L217680	Success Lake
L268006	Hensley Lake
L212390	New Hogan Lake
Southwest Division	
M404620*	DeQueen Lake
M108510*	John Martin Dam
M103520*	Cochiti Lake
M505650*	Eufaula Lake
M209580*	Lavon Lake
M508530*	John Redmond Reservoir
M106290*	Galisteo Dam
M504100*	Council Grove
M404450*	Dardanelle Lake
M406550	Gillham Lake
M110080	Santa Rosa Dam and Lake
M518050	Tenkiller Ferry Lake
M403420	Clearwater Lake
M108440	Jemez Canyon Dam
M575378	Skiatook Lake
M100070	Abiquiu Dam
M404770	Dierks Lake
M513340	Oologah Lake
M219920	Whitney Lake
M412620	Nimrod Lake
M502040	Broken Bow Lake
M217530	Stillhouse Hollow Reservoir
M412830	Norfork Lake
M209420	Joe Pool Lake
M574925	Sardis Lake
M474912	Bull Shoals Lake
M413520	Ozark Lake
M219250	Waco Lake
M506040	Fort Supply Lake
M502570	Canton Lake

(Sheet 9 of 11)

**Table A1 (Continued)**

Natural Resource Management System ID Code	Project Name
Southwest Division (continued)	
M513700	Pat Mayse Lake
M274871	Town Bluff Dam B. A. Steinhagen Lake
M510650	Marion Reservoir
M519590	Webbers Falls Lock and Dam 16
M218110	Wright Patman Dam and Lake
M103740	Conchas Lake
M401230	Beaver Lake
Combined	Addicks Dam (M302160) and Barker Dam (M375376)
M401800	Blue Mountain Lake
M513370	Optima Lake
M212260	Navarro Mills Lake
M505790	Fall River Lake
M201330	Belton Lake
M217110	Somerville Lake
M506850	Great Salt Plains
M519570	Waurika Lake
M411240	Millwook Lake
M201350	Benbrook Lake
M503890	Copan Lake
M418030	Table Rock Lake
M574945	Texoma Lake
M505360	Elk City Lake
M118480	Trinidad Lake
M118720	Two Rivers Dam
M518350	Toronto Lake
Combined	Arkansas River Tulsa District including: WD Mayo Lock and Dam 14 (M574773), Newt Graham Lock and Dam 18 (M500788), Chouteau Lock and Dam 17 (M500787)
Combined	Arkansas River Little Rock District including: Murray Lock and Dam (M400747), Pool 3 Lock and Dam (M400743), Rockefeller Lake Ormand Lock and Dam (M400749), John Paul Hammerschmidt Lake (M400753), Norrell Lock and Dam (M400741), Pool 4 Lock and Dam (M400744), David D. Terry Lock and Dam (M400746), Pool 5 Lock and Dam (M400745), Toad Suck Ferry Lock and Dam (M400748), Wilber D. Mills Lock and Dam (M400742)
M575012	Arcadia Lake
M501540	Birch Lake
M274787	Ray Roberts Lake
M507850	Hulah Lake
M575261	Truscott Brine Lake, Area VIII

(Sheet 10 of 11)

**Table A1 (Concluded)**

Natural Resource Management System ID Code	Project Name
Southwest Division (continued)	
M275357	Granger Lake
M407070	Greers Ferry Lake
M508990	Keystone Lake
M214580	Proctor Lake
M505350	El Dorado Lake
M207710	Hords Creek Lake
M508790	Kaw Lake
M203820	Cooper Lake
M507830	Hugo Lake
M202590	Canyon Lake
M216040	Sam Rayburn Reservoir
M514030	Pine Creek Lake
M507500	Heyburn Lake
M501450	Pearson-Skubitz Big Hill Lake
M506000	Fort Gibson Lake
M200930	Bardwell Lake
M520120	Wister Lake
M205850	Ferrells Bridge Dam Lake O' The Pines
M209740	Lewisville Lake
M274786	Aquilla Dam & Lake
M515370	Robert S. Kerr, Lock and Dam 15
M216090	O.C. Fisher Lake
M275358	Lake Georgetown
M206760	Grapevine Lake

*(Sheet 11 of 11)*



# **Appendix B**

## **Facsimile of Questionnaire**

### **Mailed to Corps Projects**

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U.S. ARMY CORPS OF ENGINEERS  
NATURAL RESOURCES MANAGEMENT PRACTICES AND PRIORITIES

Project(s): \_\_\_\_\_

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PROJECT WIDE . . . . .	1
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AQUATIC RESOURCES . . . . .	23
THREATENED AND ENDANGERED SPECIES . . . . .	28
WETLAND RESOURCES . . . . .	34
CULTURAL RESOURCES . . . . .	38

# **PROJECT-WIDE**

1. Estimate the allocation of your 1995 project budget for programs and activities in the functional areas below. Since there is no separate budget line item for most of these areas, estimates should represent percentage of funds actually spent on the resource.

Program Area	% of Budget	Approx. dollar amount now compared to 5 years ago
Project Operation and Maintenance (Not recreation/natural resources)	_____	decrease / same / increase
Park Management and Visitor Services	_____	decrease / same / increase
NATURAL RESOURCES		
Shoreline Management	_____	decrease / same / increase
Management of Terrestrial Resources	_____	decrease / same / increase
Management of Aquatic/fisheries Resources	_____	decrease / same / increase
Wetland Development/Preservation/Management	_____	decrease / same / increase
Threatened and Endangered Species Management	_____	decrease / same / increase
Management of Cultural Resources	_____	decrease / same / increase
Other Natural Resource Management Programs	_____	decrease / same / increase
(Specify) _____	_____	decrease / same / increase
TOTAL	100%	

2. How many employees (excluding office support staff) work under the project manager in the following areas:

	Full time GS-9 or above	Full time GS-7 or below	Part time, seasonal, IPA, etc.
Solely in natural resource management	_____	_____	_____
Solely in park management or visitor services	_____	_____	_____
Both in natural resource management and in park management or visitor services	_____	_____	_____

3. Identify the project staff member (by initials only) most directly responsible for management of the following natural resources on the project(% of time on the resource should indicate the total amount of time dedicated to the resource, regardless of whether time is spent on more than one project):

Resource	Initials of Responsible Person	% of time on this resource	List degree(s) and major(s)	List any Professional Certifications
Fisheries				
Wildlife				
Forest				
Range				
Wetlands				
T&E species				
Cultural				

4. Approximately what percentage of the natural resource management program on your project is based on the following authorities?

	percentage
a. MITIGATION (lands officially designated for mitigation by statutory authority)	
b. ENHANCEMENT (cost shared wildlife enhancement activities as authorized by PL 89-72 or any special congressional authorization)	
c. STEWARDSHIP (project lands and waters managed under the authority of the Flood Control Act of 1944)	
d. Other (please list)	
e. Don't know.	
TOTAL	100%

5. If any natural resource management programs or activities occur outside of project boundaries, indicate the following:

a. Approximately what percentage of your project budget is spent for natural resource management activities outside of the project boundary? \_\_\_\_\_

b. Describe in general terms the natural resource management programs or activities that take place outside of the project boundary.

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6. To what degree are the following documents referred to when making major natural resource management decisions on your project?

	always	sometimes	never	does not apply
General Design Memorandum	_____	_____	_____	_____
Project Environmental Impact Statement	_____	_____	_____	_____
Project Master Plan	_____	_____	_____	_____
Operational Management Plan	_____	_____	_____	_____
Annual Work Plan	_____	_____	_____	_____
Other (please list)	_____	_____	_____	_____

7. List the 5 most common natural resource issues or concerns of people residing near the project.

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_

8. List the 5 most common natural resource issues or concerns of park visitors (day users, campers, etc.)

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_

9. Rate what you perceive to be the overall significance (1=least important; 10=most important) of the following natural resources on your project from both a local perspective and a regional perspective.

Ecosystems	Local										Regional									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Forest land																				
Agricultural land																				
Native prairie																				
Other open lands (fields, pasture, etc.)																				
Scrub/shrub habitats																				
Riparian zones																				
Wetlands																				
Aquatic habitats																				
Other																				
Biota	Local										Regional									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Upland game species																				
Nongame species																				
Waterfowl																				
Furbearers																				
T&E species																				
Sensitive plant communities																				
Coldwater/stream fishes																				
Warm-water fishes																				
Other																				

10. If you have contracts, cooperative agreements, or partnerships with universities, other government agencies or national environmental organizations (e.g., Ducks Unlimited, Sierra Club) involving some aspect of natural resource management, indicate below:

Partnership Organization	Management Activity	Role of Partner	Role of Project Staff

11. If there are local volunteer groups (such as sportsman's clubs, scout troops, local civic or environmental groups) that perform or participate in natural resource management programs on your project, list each organization, describe its management program or contribution, and indicate whether this work would be likely to continue if the volunteer organization did not provide these services. Please make one entry only for each group, even if they engage in several activities (e.g., Boy Scouts of America- installation of wood duck boxes and bluebird nest boxes).

Name of Organization	Brief description of program/contribution	Status		Would work continue w/o voluntary contribution?
		check one	on-going effort	
				Y / N
				Y / N
				Y / N
				Y / N
				Y / N





15. List any areas set-aside as reserves, environmental demonstrations, research activities, or other special purposes.

Reserve, Demonstration, or Study	Description of	Developed or performed by	Years	Acreage
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

16. If you have outleases for grazing or other agricultural purposes, answer the following:

- a. What is the total acreage of project lands outleased (estimate if necessary)? \_\_\_\_\_ acres
- b. Indicate agricultural use for a typical year. Provide approximate total acreage of each crop or use.

Agricultural Use	Approximate Acreage
Grazing	_____
Hay	_____
Crops (list):	_____
_____	_____
_____	_____

c. What is the percentage of agricultural land managed using the following practice:

Conventional tillage	_____
Low-till	_____
No-till	_____

d. What percentage of your outleased agricultural land can be regarded as marginal for crop production? \_\_\_\_\_

e. Rank in order of importance (1=most important, 2=second most important, etc.) what you try to accomplish with agricultural outleases (NA=any item that is not relevant on your project).

Rank	Accomplishment
_____	Tax base for local government
_____	Benefits to wildlife associated with lease requirements (e.g., fencing, wildlife habitat improvement, erosion control practices)
_____	Benefits for local farmers/ranchers
_____	Enhance vegetative diversity and cover type management
_____	Other (specify) _____

f. Describe any restrictions, or commonly used practices, on agriculture outleases that are specifically intended to benefit wildlife.

Restrictions/Commonly Used Practices	Percentage of leased land on which these practices are applied
_____	1-25% 25-50% 50-75% 75-100%
_____	1-25% 25-50% 50-75% 75-100%
_____	1-25% 25-50% 50-75% 75-100%

g. Briefly describe management alternatives for outleased lands on which agriculture has been discontinued.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

h. Describe any significant changes in management or use of agricultural lands that are on-going or anticipated within the next 10 years.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

17. Rank the contributions (1=most important, 2=second most important, etc.; NA=does not apply) of the following programs in the management of your project's natural resources. Also, estimate how much the use of these projects has changed during the last 10 years and how much you anticipate they will change in the next 10 years.

	Rank Importance	Today as compared to 10 years ago	10 years from now compared to today
CE funded and implemented programs	—	decrease / same / increase	decrease / same / increase
Agricultural Outleases	—	decrease / same / increase	decrease / same / increase
Natural Resources Outgrants	—	decrease / same / increase	decrease / same / increase
Cooperative Agreements	—	decrease / same / increase	decrease / same / increase
Participation of Local Organizations	—	decrease / same / increase	decrease / same / increase
Specify other	—	decrease / same / increase	decrease / same / increase
Specify other	—	decrease / same / increase	decrease / same / increase

18. Identify problems on project lands that cause natural resource damage or hinder effective natural resource management. Rate the spatial extent and the severity of each problem.

Problem	Extent										Severity											
	Q=none	1=rare	2	3	4	5	6	7	8	9	10=common	Q=none	1=slight	2	3	4	5	6	7	8	9	10=severe
Property Encroachment	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Livestock Trespass	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Theft of Timber	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Wildlife Poaching	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Dumping of Trash	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Off-road Vehicles	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Vandalize/Theft of Cultural Resources	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Shoreline Erosion	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Wildfire	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Road/utility Easements	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Other:	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
Other:	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	

19. Describe changes in the use of lands adjacent to your project, evaluate the extent of these changes, and estimate trends over next 10 years. Examples of changes in land use include increased development, conversion to or from agriculture, or changes in forest cover types.

Nature of Change	Extent										Estimated trend over next 10 years									
	1=minor	2	3	4	5	6	7	8	9	10=extensive										
	1	2	3	4	5	6	7	8	9	10	decrease / same / increase									
	1	2	3	4	5	6	7	8	9	10	decrease / same / increase									
	1	2	3	4	5	6	7	8	9	10	decrease / same / increase									

**TERRESTRIAL RESOURCES**

20. Which of the following broad ecosystems or cover types occur on your project?

Ecosystem/Cover type	Exist on Project?	Actual or estimated area (acres)
Forest Land	Y / N	_____
Open woodland/savanna	Y / N	_____
Grasslands or Openlands	Y / N	_____
Shrub/Scrub/Brushland	Y / N	_____
Other _____	Y / N	_____
Other _____	Y / N	_____

21. If available, provide a list of cover types identified on your project and an estimate of the acreage of each. Use separate sheets if more space is needed. These may be photocopied from your OMP or other documents.

22. Is there a current inventory of project resources for the following terrestrial biota:

Biota	No	Inventory Execution		Year Prepared	Prepared By (agency)
		Partially Complete	Complete		
a. Reptiles/Amphibians	_____	_____	_____	_____	_____
b. Mammals	_____	_____	_____	_____	_____
c. Birds	_____	_____	_____	_____	_____
d. Invertebrates	_____	_____	_____	_____	_____
e. Plants	_____	_____	_____	_____	_____

23. Are USDA soil surveys and land use capability recommendations used in making natural resource management decisions? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, is soil information included in each site specific management prescription in your OMP?  
Yes \_\_\_\_\_ No \_\_\_\_\_

24. If prescribed burning is used on the project, indicate the following:

a. How many acres of project land are periodically burned?

<u>Land type</u>	<u>Acreage</u>
Hardwood Forest	_____
Coniferous Forest	_____
Grasslands, including Range, Permanent Forest Openings, etc.	_____
Marsh/Wetlands	_____
Other	_____

b. Indicate the primary purposes for which prescribed burning is used (circle all that apply).

Purpose of burn

Wildfire Hazard Reduction  
Forest Site Preparation  
Forest Understory Management  
Maintenance of Grasslands  
Native Prairie Restoration  
Wildlife Habitat Management  
Marsh Management  
Vector Control  
Other \_\_\_\_\_

Prescribed for  
this purpose

No / Yes  
No / Yes  
No / Yes  
No / Yes  
No / Yes  
No / Yes  
No / Yes  
No / Yes  
No / Yes

25. If you have at least 100 acres of forested land on your project, answer the following:

- Do you have a current inventory of forested lands? (circle one) Yes / No
- If yes, what forest inventory system do you use? (circle letter and/or supply appropriate information)
  - US Forest Service: Continuous Inventory of Stand Condition Classes (or similar system)
  - Remeasurement of Permanent Growth/Inventory Plots
  - Other (briefly describe) \_\_\_\_\_

c. If yes, identify the parties directly involved in the following management activities on forested project lands: (check all that apply)

	Inventory/timber cruises	Formulation of Management Prescriptions
Project foresters	_____	_____
Other project personnel	_____	_____
Consulting foresters	_____	_____
State forestry personnel	_____	_____
Other (specify) _____	_____	_____

26. For the major forest cover types on your project, provide or estimate the following:

Cover Type Categories	Predominate Forest type	Estimated % of project Forested Land	Typical Stand size (acres)	Typical Rotation in Years	% Acreage Old Growth
Bottomland Hardwoods (including riparian woodlands)	_____	_____	_____	_____	_____
Upland Hardwoods	_____	_____	_____	_____	_____
Mixed Coniferous/ Hardwoods	_____	_____	_____	_____	_____
Planted Coniferous Stand	_____	_____	_____	_____	_____
Naturally Regenerated Coniferous Stand	_____	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____

27. On average, what percentage of forested land, subject to commercial harvest, will be regenerated by the following methods?

	Clear-cutting (even-aged management)	Selection cutting (uneven-aged management)
Hardwood	_____	_____
Coniferous	_____	_____



28. Approximately how many acres of forest land are held in reserve primarily for wildlife (e.g., lands not specifically managed for commercial harvest? \_\_\_\_\_

29. Is fuelwood cutting allowed on your project? Yes \_\_\_\_\_ No \_\_\_\_\_

a. If yes, what percentage of forest land is open to fuelwood cutting? \_\_\_\_\_

b. What products are allowed to be harvested as part of fuelwood cuts?

Dead standing trees \_\_\_\_\_  
Fallen timber \_\_\_\_\_  
Residual tree parts \_\_\_\_\_  
Harvest debris only \_\_\_\_\_

30. Is chemical treatment employed as part of your forest management program? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, chemicals are used for which of the following objectives:

Chemical thinning \_\_\_\_\_

Pest control \_\_\_\_\_

Other \_\_\_\_\_

31. Identify any on-going or anticipated changes in management of major forest types such as changes in stand rotation, conversion from one cover type to another, or net increases or decreases in forest acreage. Explain why the change is occurring; be as specific as possible.

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35. Which of the following management techniques are used on openland habitats on your project?

Practice	Habitat type	Degrees of Use
Prescribed burning		never/sometimes/regularly
Mowing		never/sometimes/regularly
Disking/plowing		never/sometimes/regularly
Bush hogging		never/sometimes/regularly
Chaining/cabling		never/sometimes/regularly
Land imprinting		never/sometimes/regularly
Seeding/planting		never/sometimes/regularly
Other		never/sometimes/regularly

36. Describe any changes in the condition or management of openlands that are on-going or anticipated in the next 10 years.

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37. If native prairie has been identified or established on your project, provide the following information:

- Number of tracts \_\_\_\_\_ and Total acreage \_\_\_\_\_
- Have plant species in prairie habitat been inventoried?    No | Yes partially | Yes completely
- Are any other organizations participating in prairie management on the project?    No / Yes

If yes, identify the organization and describe its role. \_\_\_\_\_

- Briefly, what steps have been taken to restore, protect, or manage the native prairie on your project?

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38. Indicate the importance of the following in determining the management of terrestrial resources on your project. Also, rank them (1=highest, 2=second highest, etc.) in order of the priority they receive in your management program.

Management Objective	Importance										Rank
	None	Low								High	
Public Use Benefits	0	1	2	3	4	5	6	7	8	9	10
Growth/Harvest Commercial Products	0	1	2	3	4	5	6	7	8	9	10
Resource Stewardship	0	1	2	3	4	5	6	7	8	9	10
Regulatory Compliance	0	1	2	3	4	5	6	7	8	9	10
Reserves or Environmental Demonstrations	0	1	2	3	4	5	6	7	8	9	10
Other		1	2	3	4	5	6	7	8	9	10

39. Rank in order of importance (1=most important, 2=second most important, etc.) the following objectives for managing terrestrial resources on your project. (NA=any item that is not applicable at your project).

Objective	Importance during last 10 years (0=None, 1=Low..., 10=High)										Importance in next 10 years (0=None, 1=Low..., 10=High)											
	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Manage habitat for selected game species																						
Manage buffers for aquatic and/or wetland site protection																						
Manage habitat for selected non-game species or groups of species (excluding T&E)																						
Manage for a diversity of habitat types and age classes for as many species as possible																						
Manage vegetation types which have commercial potential																						
Manage habitat for T&E species																						
Other (specify)																						
Other (specify)																						

40. Indicate the types of wildlife management practices that are used on your project and the target species for each. Since some practices may be applied by state (fish and wildlife or other) agencies, other federal agencies, or other government or private organizations, which group normally accomplishes these activities.

Check all that apply	Management practice	Target species	Organization responsible for practice
<input type="checkbox"/>	Fences and crossings		
<input type="checkbox"/>	Brush piles		
<input type="checkbox"/>	Edge maintenance		
<input type="checkbox"/>	Food plots or patches		
<input type="checkbox"/>	Other food and cover plantings		
<input type="checkbox"/>	Water developments (e.g., catchments, guzzlers)		
<input type="checkbox"/>	Creation of forest openings		
<input type="checkbox"/>	Prescribed burning		
<input type="checkbox"/>	Supplemental feeding		
<input type="checkbox"/>	Stocking		
<input type="checkbox"/>	Forest stand density manipulations		
<input type="checkbox"/>	Nesting and roosting structures		
<input type="checkbox"/>	Pasture development		
<input type="checkbox"/>	Crop specification for agricultural leases		
<input type="checkbox"/>	Corridor development		
<input type="checkbox"/>	Snag management		
<input type="checkbox"/>	Other		

41. Identify animal control programs, species of concern, and extent of the problem on your project.

Program or Practice	Target Species	Projected impact of the problem over the next 10 years
a. Predator control		decrease / same / increase
b. Management hunts to control populations		decrease / same / increase
c. Nuisance wildlife control		decrease / same / increase
d. Control of feral dog/cats		decrease / same / increase

42. If hunting is allowed, list in order (most popular first) the 5 most popular terrestrial species that are hunted on your project. Also, rate the importance of your project as a provider of public hunting opportunity for this species in an area extending 50 miles (in any direction) around the project.

Species	Importance of Project as a provider of hunting opportunity									
	10=sole provider.....1=minor provider									
1. _____	10	9	8	7	6	5	4	3	2	1
2. _____	10	9	8	7	6	5	4	3	2	1
3. _____	10	9	8	7	6	5	4	3	2	1
4. _____	10	9	8	7	6	5	4	3	2	1
5. _____	10	9	8	7	6	5	4	3	2	1

43. Indicate if public hunting is managed at your project through any of the following methods.

Practice	Yes/No	Who manages the practice (check all that apply)		Importance to achieving management objectives (0=none, 1=low, 10=high)
		Corps	State / Other	
a. Closure of areas	_____	_____	_____	0 1 2 3 4 5 6 7 8 9 10
b. Issuing permits	_____	_____	_____	0 1 2 3 4 5 6 7 8 9 10
c. Limiting hunting numbers	_____	_____	_____	0 1 2 3 4 5 6 7 8 9 10
d. Limiting means of hunting	_____	_____	_____	0 1 2 3 4 5 6 7 8 9 10
e. Special group hunts (e.g., parent/child)	_____	_____	_____	0 1 2 3 4 5 6 7 8 9 10
f. Other	_____	_____	_____	0 1 2 3 4 5 6 7 8 9 10

44. If there are any annual (or periodic) surveys that are intended to monitor the status of terrestrial plants or animals, itemize them in the following categories.

a. Habitat condition surveys (forage conditions, nest site availability, cover surveys, etc).

Target species or group	Description of Survey	Frequency		Performing organization
		Annual	2-5 yrs 5+ yrs	

b. Population surveys: (bird censuses, road surveys, drive or flush surveys, roost counts, time/area counts, lodge counts, etc.)

Species or group	Description of Survey	Frequency		Performing organization
		Annual	2-5 yrs 5+ yrs	

c. Recruitment surveys (nest counts, hatching success, brood surveys, den checks, etc.)

Species or group	Description of Survey	Frequency		Performing organization
		Annual	2-5 yrs 5+ yrs	

d. Harvest surveys (check station, voluntary reporting system, mail survey, etc).

Species or group	Description of Survey	Frequency		Performing organization
		Annual	2-5 yrs 5+ yrs	

45. Do you use Habitat Suitability Indices (HSI) to determine habitat quality? Yes / No  
If yes, indicate for which species habitat quality has been determined and the method used (mark appropriate response and supply information as required).

Species (list)	(✓ if applicable)				Other (specify)
	Modified				
	USFWS Bluebook	USFWS Bluebook	Expert Opinion		

46. Do you make habitat quality evaluations for groups of species or for communities? Yes / No  
If yes, indicate which groups of species or communities and the source of the models you used.

Groups of Species/Communities	Source of Model(s)

47. Briefly describe any perceived needs by the project to restore, protect, or manage project terrestrial resources (including riparian zones) that are not part of your current management program.

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## AQUATIC RESOURCES

48. Rate the importance (0=not important...5=moderately important...10=very important) of the following concerns in the management of aquatic resources on your project. Where you can, also rate the anticipated importance of these considerations in the next 10 years.

Potential Management Concerns	Current Importance										Importance In Next 10 Years											
Water Quality	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Pollution/Contamination	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Siltation/Sedimentation	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Condition of Fishery	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Shoreline Erosion	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Nuisance Aquatic Plants	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Boater Crowding	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Aquatic User-group Conflicts	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Specify other	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Specify other	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10

49. Rate the extent to which project operations influence the following factors:

(circle all that apply)																		
Factors		Importance										Area of concern						
Seasonal water fluctuations	0	1	2	3	4	5	6	7	8	9	10	upstream /	on project /	downstream				
Water Quality	0	1	2	3	4	5	6	7	8	9	10	upstream /	on project /	downstream				
Pollution/Contamination	0	1	2	3	4	5	6	7	8	9	10	upstream /	on project /	downstream				
Siltation/Sedimentation	0	1	2	3	4	5	6	7	8	9	10	upstream /	on project /	downstream				
Fishery Considerations	0	1	2	3	4	5	6	7	8	9	10	upstream /	on project /	downstream				
Shoreline Erosion	0	1	2	3	4	5	6	7	8	9	10	upstream /	on project /	downstream				
Resource Use Conflicts	0	1	2	3	4	5	6	7	8	9	10	upstream /	on project /	downstream				
Specify Other	1	2	3	4	5	6	7	8	9	10		upstream /	on project /	downstream				
Specify Other	1	2	3	4	5	6	7	8	9	10		upstream /	on project /	downstream				

(circle all that apply)

50. Describe any major requirements or restrictions on project operations intended to accommodate recreation or natural resources (e.g., minimum flow releases for anadromous fishes).

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

51. What percentage of your aquatic area is infested with nuisance aquatic vegetation? \_\_\_\_\_

52. If nuisance aquatic plants or animals are present or expected, characterize their status on the project with the following information.

Nuisance Species	Present coverage (%)	Year Introduced (approx.)	Coverage		Coverage expected during next 10 years
			during last 10 years	during next 10 years	
_____	_____	_____	decreasing/stable/increasing	decreasing/stable/increasing	decreasing/stable/increasing
_____	_____	_____	decreasing/stable/increasing	decreasing/stable/increasing	decreasing/stable/increasing
_____	_____	_____	decreasing/stable/increasing	decreasing/stable/increasing	decreasing/stable/increasing

53. Identify any recognized conflicts among different uses (ex. hydropower operations vs fish recruitment) or user groups (ex. fisherman vs pleasure boaters) of the aquatic resources on the project.

Conflicting uses or user groups	Severity										Trend
	1=low	2	3	4	5=moderate	6	7	8	9	10=very high	
_____	1	2	3	4	5	6	7	8	9	10	decreasing/same/increasing
_____	1	2	3	4	5	6	7	8	9	10	decreasing/same/increasing
_____	1	2	3	4	5	6	7	8	9	10	decreasing/same/increasing
_____	1	2	3	4	5	6	7	8	9	10	decreasing/same/increasing

54. Have any public health-related advisories ever been issued by any local, state, or federal agency in regard to:

Activity	Ever been issued?	Currently in effect?	If yes, identify cause
Eating fish	No / Yes	No / Yes	
Swimming	No / Yes	No / Yes	
Other public uses	No / Yes	No / Yes	

55. If a sport fishery is present on your project, please answer the following questions:

a. List (up to five) and rank the most important game fishes on your project and indicate the status of standing stocks of these fishes during the last 10 years and the anticipated status over the next 10 years.

Species	Importance (Rank)	Size of Standing Stocks		
		Last 10 years	Next 10 years	
		decrease/same/increase/don't know	decrease/same/increase/don't know	
		decrease/same/increase/don't know	decrease/same/increase/don't know	
		decrease/same/increase/don't know	decrease/same/increase/don't know	
		decrease/same/increase/don't know	decrease/same/increase/don't know	
		decrease/same/increase/don't know	decrease/same/increase/don't know	

b. Identify game and non-game fishes that have been stocked in project waters.

Species	Frequency of stocking
	annually / every 2-4 years / 5+ years
	annually / every 2-4 years / 5+ years
	annually / every 2-4 years / 5+ years
	annually / every 2-4 years / 5+ years
	annually / every 2-4 years / 5+ years

c. Identify any harvest or stock assessment surveys of fishes performed on the project:

Type of Survey	Frequency of Surveys
— Creel Surveys	annually / 2-3 years / 4-6 years / 7+ years
— Rotenone Surveys	annually / 2-3 years / 4-6 years / 7+ years
— Electroshocking Surveys	annually / 2-3 years / 4-6 years / 7+ years
— Gill Net Surveys	annually / 2-3 years / 4-6 years / 7+ years
— Other _____	annually / 2-3 years / 4-6 years / 7+ years
— No harvest or stock data are collected	

d. If creel surveys are performed on the project, indicate which of the following are computed from the information collected in these surveys.

— fisherman catch per unit effort	— estimated fish harvest
— fish length/weight statistics	— fisherman attitudes or opinions
— trip expenditures	— don't know

e. Indicate if Corps (district or project) personnel or funds are utilized for any of the following fishery management activities:

Description	Activity not undertaken on project		Corps	
	Responsible agency?		Funds?	Personnel?
Collection of creel or stock assessment data			No / Yes	No / Yes
Analysis of creel or stock assessment data			No / Yes	No / Yes
Participation in stocking efforts			No / Yes	No / Yes
Management/control of nuisance aquatic vegetation			No / Yes	No / Yes
Other _____			No / Yes	No / Yes
Other _____			No / Yes	No / Yes

56. Briefly describe any perceived needs to restore, protect, or manage aquatic resources that are not part of your current management program.

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# **THREATENED AND ENDANGERED (T&E) SPECIES**

57. Have any inventories been conducted on the project to identify?  
 Federally listed Threatened and Endangered (T&E) species No / Yes  
 Potential preferred habitats for T&E species No / Yes

58. If any inventories for federally listed T&E species have been conducted on the project, answer the following:

a. Inventories for T&E species on the project were conducted by (check all that apply)?

- ☐ Project personnel
- ☐ Other COE elements: specify \_\_\_\_\_
- ☐ U.S. Fish and Wildlife Service
- ☐ National Marine Fisheries Service
- ☐ State agency
- ☐ College or University
- ☐ The Nature Conservancy
- ☐ Private Sector Contractor
- ☐ Other: specify \_\_\_\_\_

b. Which of the following best characterizes T&E inventories that have been conducted on the project (circle number that best applies)?

- 1) Comprehensive, project-wide inventory for all known or probable T&E species that occur in the region
- 2) Thorough inventory for selected species known to occur on the project
- 3) cursory inventories only
- 4) Other (please specify) \_\_\_\_\_

c. Indicate which groups of T&E species have been surveyed and the extent of those surveys by circling the appropriate responses.

Category	Potential T&E species surveyed?	Extent of project area surveyed?	Were candidate species surveyed?
Federally listed fishes	none / some / all	none / partially / completely	No / Yes
Federally listed birds	none / some / all	none / partially / completely	No / Yes
Federally listed mammals	none / some / all	none / partially / completely	No / Yes
Federally listed reptiles and amphibians	none / some / all	none / partially / completely	No / Yes
Federally listed invertebrates	none / some / all	none / partially / completely	No / Yes
Federally listed plants	none / some / all	none / partially / completely	No / Yes
Critical habitats for federally listed species	none / some / all	none / partially / completely	No / Yes
State listed plants or animals	none / some / all	none / partially / completely	No / Yes

d. Estimate the effort already expended and the effort that will be expended in the next 10 years toward final completion of inventories for federally listed T&E species.

	Stage of completion (%)										
	0	10	20	30	40	50	60	70	80	90	100
Present Time:											
In another 10 years:	0	10	20	30	40	50	60	70	80	90	100

59. If any federally listed T&E species have been found on the project, answer the following:

a. Identify the federally listed T&E species that have been found on the project.

Species name	Taxonomic identify (circle one)
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant

b. Identify species found on the project that are proposed or candidate T&E species or those officially classified as at risk by the U.S. Fish and Wildlife Service.

Species name	Taxonomic identify (circle one)
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant
	invertebrate / fish / amphibian / reptile / bird / mammal / plant

60. Does your OMP address T&E species management concerns? Yes \_\_\_\_\_ No \_\_\_\_\_

61. Are any of the following available for T&E species identification, protection and management (check all that apply)?

- ☐ Current management plan for one or more T&E species
- ☐ Agreement with other agencies or organizations for management of T&E species or their habitats: identify agency(s) \_\_\_\_\_
- ☐ Access to formal training on T&E species
- ☐ Availability of reference materials on T&E species (e.g., copy of recovery plan, other) \_\_\_\_\_

62. Identify monitoring activities for T&E species found on the project by providing the following information.

Species write in	Type of inventory check	Typical inventory interval in years circle one	Year last performed?	Performing organization(al)
_____	Population status	1 2-3 4+	_____	_____
_____	Habitat condition	1 2-3 4+	_____	_____
_____	Recruitment	1 2-3 4+	_____	_____
_____	Population status	1 2-3 4+	_____	_____
_____	Habitat condition	1 2-3 4+	_____	_____
_____	Recruitment	1 2-3 4+	_____	_____
_____	Population status	1 2-3 4+	_____	_____
_____	Habitat condition	1 2-3 4+	_____	_____
_____	Recruitment	1 2-3 4+	_____	_____

63. Do you manage critical habitats (as defined by the U.S. Fish and Wildlife Service) for any T&E species? Yes \_\_\_\_\_ No \_\_\_\_\_. If yes, identify the species for which critical habitat are managed.



64. Indicate whether the presence of any T&E species substantially affects or is affected by any of the following (check all that apply):

Activity	Species	Explain or Specify
— Visitor recreation	_____	_____
— Project operations	_____	_____
— Management of other natural resources	_____	_____
— Other	_____	_____

65. Do land use activities on private or public lands bordering the project adversely affect your ability to protect or manage T&E species on the project (circle one)? No / Yes

If yes, identify species and describe conditions adversely affecting protection and/or management of T&E species on the project.

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66. Approximately what percentage of T&E management activities are conducted in off-project areas? \_\_\_\_\_  
What is the nature of these activities? (briefly describe)

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67. In the past 5 years, approximately how many times have you requested informal consultation with the U.S. Fish and Wildlife Service or National Marine Fisheries Service regarding federally listed T&E species (circle one)?

never / 1 time / 2 times / 3-5 times / 6-10 times / 11+ times

If you indicated 1 or more informal consultations, which of the following characterize the nature of the consultation(s) (check all that apply):

- ☐ request for project visit and assistance with identification of species
- ☐ request for a screening list of T&E species on the project
- ☐ request for background information on T&E life history or habitat requirements
- ☐ request for assistance in surveying or developing inventories or surveys for T&E species
- ☐ request for assistance in formulating T&E management objectives or plans
- ☐ request informal opinion of possible project action
- ☐ other

68. Has a formal Section 7 consultation ever taken place in regard to a proposed project action potentially affecting a federally listed T&E species (circle one)?

No / Yes

a. If yes, provide the following information for each occurrence of a formal section 7 consultation include additional pages, if necessary:

Year initiated	Year (if) resolved	Species of concern	Jeopardy opinion?	Project action requiring consultation	Outcome (circle one)				
			No/Yes		unresolved; opinion pending	disagreed with opinion; action unresolved	withdrew proposed action	modified proposed project action to eliminate concern	mitigated effects and proceeded with proposed action
			No/Yes		unresolved; opinion pending	disagreed with opinion; action unresolved	withdrew proposed action	modified proposed project action to eliminate concern	mitigated effects and proceeded with proposed action

69. If your project has natural resource outgrants, answer the following.

a. Does the lease agreement(s) specify T&E species protection and management responsibilities on the outgrant(s)?

Yes / No

b. Who most directly oversees the following T&E activities on lease holdings?

Activity	Activity Occurs		Who is Responsible for Activity?		
	On Outgrants		Project	Lessee	Shared Don't Know
Species inventories or surveys	Yes / No	Don't Know	—	—	—
Population/habitat monitoring	Yes / No	Don't Know	—	—	—
Implementing T&E species protection and management	Yes / No	Don't Know	—	—	—

70. Briefly describe any perceived needs to restore, protect, or manage project Threatened and Endangered species resources that are not part of your current management program.

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## WETLAND RESOURCES

71. Provide a gross estimate of the number of acres of natural and constructed wetlands on your project.

Naturally occurring wetlands \_\_\_\_\_ acres      Constructed wetlands \_\_\_\_\_ acres

72. Has a wetland inventory been conducted for project lands? (circle) Yes / No (if no, go to question 76)

73. Which of the following best categorizes your wetlands inventory? (circle letter)

- a. Comprehensive inventory of all project wetlands
- b. Thorough inventory of selected high priority wetlands
- c. cursory inventory of general wetland types
- d. Other (describe) \_\_\_\_\_

74. Estimate the degree of completion of your wetland inventory. (circle)

	Stage of Completion (%)										
Present time:	0	10	20	30	40	50	60	70	80	90	100
In another 5 years:	0	10	20	30	40	50	60	70	80	90	100

75. What method was used to inventory and classify wetlands on your project? (circle letter)

- a. USAF Corps of Engineers Wetland Delineation Manual (commonly called the "87 Manual")
- b. National Wetland Inventory System, e.g., Cowardin et al. (1992) method
- c. Wetland Classification System of Shaw and Fredine (1956)
- d. General estimate from project data and/or maps
- e. Other (describe): \_\_\_\_\_

76. Who was responsible for conducting the wetland inventory? (circle letter and supply appropriate information).

	Was delineator Certified? (circle)
	Yes / No / Don't know
a. Project personnel . . . . .	Yes / No / Don't know
b. District personnel . . . . .	Yes / No / Don't know
c. WES personnel . . . . .	Yes / No / Don't know
d. USFWS . . . . .	Yes / No / Don't know
e. State agency (specify) _____	Yes / No / Don't know
f. Other (specify) _____	Yes / No / Don't know

77. If wetlands on your project have been identified and mapped using any procedures, please list the wetland types and acreage of each.

Wetland type	Acreage
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

78. Rate (0=none, 1=low, and 10=high) the importance of the following objectives in management of your project's wetland resources:

	Rate for the present time										Rate for the next 10 years											
a. Waterfowl	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
b. Furbearer habitat	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
c. T&E species	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
d. Other non-game species	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
e. Wetland biodiversity	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
f. Wastewater treatment	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
g. Buffer zone management for aquatic areas	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
h. Vector control	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
i. Fish spawning	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
j. Other (specify) _____	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10

79. List the species and associated wetland types most often featured in your wetland management programs (e.g., wood ducks/beaver ponds).

Species	Wetland Type	Habitat Importance (check all that apply) Breeding Migratory Wintering

80. Indicate the importance of the following wetland management practices on the project

Practices	Importance 0=none, 1=low, 10=high										Species for which practices are designed to benefit	
	0	1	2	3	4	5	6	7	8	9		10
Beaver pond management	0	1	2	3	4	5	6	7	8	9	10	
Moist soil management	0	1	2	3	4	5	6	7	8	9	10	
Greentree reservoir operation	0	1	2	3	4	5	6	7	8	9	10	
Artificial potholes	0	1	2	3	4	5	6	7	8	9	10	
Agricultural food plots	0	1	2	3	4	5	6	7	8	9	10	
Vegetation establishment and manipulation	0	1	2	3	4	5	6	7	8	9	10	
Nesting structures	0	1	2	3	4	5	6	7	8	9	10	
Prescribed burning	0	1	2	3	4	5	6	7	8	9	10	
Reservoir water level manipulation	0	1	2	3	4	5	6	7	8	9	10	
Buffer zone establishment	0	1	2	3	4	5	6	7	8	9	10	
Other	0	1	2	3	4	5	6	7	8	9	10	

81. What percentage of your wetland area is infested with nuisance vegetation? \_\_\_\_\_

82. If nuisance wetland plants or animals are present or expected, characterize their status on the project with the following information.

Nuisance Species	Present coverage (%)	Year Introduced (approx.)	Coverage during last 10 years	Coverage expected during next 10 years
			decreasing/stable/increasing	decreasing/stable/increasing
			decreasing/stable/increasing	decreasing/stable/increasing
			decreasing/stable/increasing	decreasing/stable/increasing

83. Identify changes in the use of lands adjacent to your project and describe how these changes are affecting (positively or negatively) your ability to manage project wetlands.

Nature of Change	Extent 1=minor...10=extensive	Effect on Project Wetlands
	1 2 3 4 5 6 7 8 9 10	
	1 2 3 4 5 6 7 8 9 10	
	1 2 3 4 5 6 7 8 9 10	

84. Briefly describe any perceived needs to restore, protect, or manage project wetlands that are not part of your current management program.

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### CULTURAL RESOURCES

Cultural resources management includes the responsibility for the stewardship of historic, archaeological, and paleontological resources on CE project lands.

85. Approximately what percent of your project lands have been surveyed and inventoried for cultural resources?  
\_\_\_\_\_ %

86. Has a historic preservation plan been prepared for your project? (circle one) Yes / No

87. How many cultural sites have been identified on your project? \_\_\_\_\_

88. How many sites have been listed on the Federal Register? \_\_\_\_\_

89. How many cultural resource sites on your project have been formally evaluated for significance? (circle one)

0    1-10    11-25    26-50    51-75    76-100    over 100

90. Who conducted site evaluations on your project? (check all that apply)

- contract archaeologists
- in-house archaeologists
- State Historic
- Preservation Officer
- Others (identify) \_\_\_\_\_



91. Indicate your assessment of the relative importance of the following cultural resource management objectives on your project. (circle the appropriate number representing the level of importance, circle 0 if the item is not an objective).

Objective	Importance at Present Time										Importance next 10 years											
	Low	1	2	3	4	5	6	7	8	9	High	Low	1	2	3	4	5	6	7	8	9	High
Identification and description of cultural resource sites	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Evaluation of the significance of sites	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Assessment of the impact of earth disturbing activities on sites	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Avoidance of impacts to sites	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Site preservation and protection	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Mitigation of adverse impacts on sites	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Native American consultation	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Cultural resource repatriation	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Public interpretation	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10
Other:																						
	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	

92. Identify the cultural resource site protection and preservation practices utilized on your project in the past ten years (check all that apply).

Utilized in past 10 years	Practice
<input type="checkbox"/>	structural stabilization (i.e., engineering materials)
<input type="checkbox"/>	stabilization with natural materials
<input type="checkbox"/>	erosion control in upland areas
<input type="checkbox"/>	signing (interpretative and warning)
<input type="checkbox"/>	fencing
<input type="checkbox"/>	monitoring (e.g. periodic site visits)
<input type="checkbox"/>	surveillance (e.g. electronic devices)
<input type="checkbox"/>	site burial
<input type="checkbox"/>	other: (identify) _____

93. Are there any cultural resource issues that have affected your ability to manage other natural resources.  
 Yes\_\_\_\_ No\_\_\_\_. If yes, briefly describe the conflict.

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94. Briefly describe any perceived needs to protect or manage cultural resources that are not a part of your current management program.

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# REPORT DOCUMENTATION PAGE

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<b>6. AUTHOR(S)</b> Richard L. Kasul, Chester O. Martin, R. Scott Jackson				
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<b>12a. DISTRIBUTION/AVAILABILITY STATEMENT</b> Approved for public release; distribution is unlimited.			<b>12b. DISTRIBUTION CODE</b>	
<b>13. ABSTRACT (Maximum 200 words)</b>  Natural resources management on U.S. Army Corps of Engineers water resources development projects was documented from the responses of management personnel to a detailed questionnaire mailed to a stratified random sample of projects. The survey was sent in January 1996 to 66 Corps projects (19 percent of the sampling frame) selected at random within 10 Corps Divisions located in the contiguous United States. Results were based on 62 completed questionnaires returned through August 1996, an overall response rate of approximately 94 percent.  Corps projects reported spending an average of 6.6 percent (0-29 percent) of their project budget on natural resources management activities associated with terrestrial (50 percent of natural resources budget), aquatic (27 percent), and wetland (12 percent) resources and threatened and endangered species (12 percent). Natural resources management programs were highly individualized because of project-specific differences in the type and condition of available resources; the availability of funding, personnel, and management partners; and the local physical and cultural environment surrounding each project. Management efforts were typically directed at a broad range of resource uses including outdoor recreation, fish, wildlife, timber, and agriculture. A large share of the natural resources management effort was usually associated with outdoor recreation, particularly fishing and hunting recreation.  (Continued)				
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**13. (Concluded).**

Contributions of management partners strongly influenced natural resources management on Corps projects. Most influential were state fish and wildlife agencies, which participated in some aspect of natural resource management on almost all Corps projects. State agencies typically managed most aspects of the recreational fishery on Corps projects. They also managed most of the natural resource outgrants on Corps projects where game management and hunter recreation were the primary management objectives.

Corps projects indicated a commitment to maintaining the recreational aspects of their natural resources management programs. However, they also indicated a need for, and anticipated expansion of, stewardship activities along a broad front. Completion of resource inventories, expansion of threatened and endangered species efforts, and increased management of nongame wildlife were among the stewardship activities that projects hoped to expand. They also recognized management challenges associated with increased development and other land-use changes occurring along project boundaries. Projects expected to expand management efforts and meet emerging challenges by expanding the natural resource management efforts of project staff and by enlarging the role of non-Corps partners in natural resource management activities.

**14. (Concluded).**

Aquatic resources	Management issues	Threatened and endangered species
Fisheries	Management objectives and practices	Trends
Game and nongame wildlife	Natural resources	Wetlands
Mail survey		